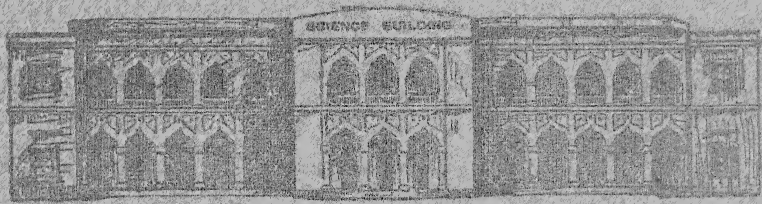
THE ALLAHABAD FARMER



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VOL. VI.] JANUARY, 1932 [No. 1.

WORK

Let me but do my work from day to day
In field or forest, at desk or loom,
In roaring market-place or tranquil room;
Let me but find it in my heart to say,
When vagrant wishes beckon me astray,
"This is my work; my blessing, not my doom;
Of all who live, I am the one by whom
This work can best be done in the right way."
Then shall I see it not too great or too small
To suit my spirits and to prove my powers;
Then shall I, cheerful, greet the labouring hours,
And cheerful turn, when the long shadows fall
At eventide, to play and rest
Because I know for me my work is best.

VAN DYKE.

MOSQUITOES AND MALARIA

CAPTAIN H.W.MULLIGAN, M.D., I.M.S.

(Officer-in-charge, Ross Field Experimental Station for Malaria, Karnal)

Everyone in the tropics is familiar with malarial fever. Most of us suffer from it at some period, and all of us are witnesses of some of its consequences, yet very few of us fully realize the magnitude of this scourge. Malaria claims its toll mainly from the infant and the aged population, though its ravages can also be seen among all classes of the community. Sir Ronald Ross has estimated that more than one-quarter of all the sickness occurring in warm countries is attributable to malaria, while Sir William Osler has designated malaria as the greatest single destroyer of the human race, a statement which, sweeping as it may appear, is by no means exaggerated. It has been estimated that in India alone over one million deaths per annum are directly due to malaria, not to mention the vast amount of sickness and loss of man-power of which the death-roll is merely an index. In certain parts of the country vast epidemics of malaria may occur at intervals, the consequences of which may be much more serious than those attendant upon the more dramatic epidemic diseases such as cholera, plague, and small-pox.

It is now common knowledge that malaria is spread through the agency of mosquitoes. This discovery was made about thirty years ago by Sir Ronald Ross (then Major Ross, I.M.S.), and it marks one of the most romantic passages in the history of medical research, for on the knowledge of the means of spread of this dreadful disease depends our only reasonable hope of relieving the sufferings and physical incapacity of the peoples of two-thirds of the inhabited world. Already Ross's discovery has been put to great practical utility, and on it has depended the successful completion of schemes which had hitherto been found impossible on account of the intensity of malaria. Unfortunately there is still a long way to go before the world will have received full benefit from Ross's discovery.

MOSQUITOES.

Mosquitoes in India are responsible for the spread of diseases other than malaria. Thus dengue fever is transmitted by the bites of mosquitoes belonging to the genus *Aedes* (*Stegomyia*), the members of which are known as "tiger" mosquitoes on account of their striped appearance and their ferocity in attack. These mosquitoes frequently attack man by day, even in bright sunlight, and the resultant bite is most irritating. Mosquitoes belonging to the genus

Culex are responsible for the transmission, in certain parts of India, of filariasis, a disease which is popularly known chiefly on account of the associated symptom of "elephantiasis." The mosquitoes responsible for the transmission of this disease are common all over India, and have unspotted wings and a long proboscis with which they are capable of inflicting a painful bite. Malaria is transmitted *only* by certain species belonging to the genus *Anopheles*, the adults of which are comparatively small, quiet, and inoffensive. They have spotted wings, a long proboscis, and, when at rest, are seen to project at an angle from the surface on which they are resting. Unlike many of the commoner and harmless mosquitoes, Anophelines (especially the malaria-carrying species) are usually particular in their choice of breeding-places, the different species showing definite preferences not only in their breeding-places, but also in the source of their blood meals.

Mosquitoes, like other insects such as the butterfly, have four distinct stages in their development, viz., the egg, the larva, the pupa or nymph, and the imago or mature adult.

The female Anopheline lays several hundreds of eggs at a time and always deposits them on water. In warm weather the eggs hatch out into larvæ in the course of a few days. The larvæ can be seen in collections of clean water as small wriggling bodies now shooting across the under surface of the water, now diving to the bottom, now at rest at the surface at which they always maintain the horizontal position. This characteristic attitude serves as a ready method of distinguishing the larvæ of Anophelines from those of other mosquitoes whose larvæ are more sluggish in their movements and invariably hang head downwards, only the tail end, which is provided with an elongated breathing tube, coming to the surface. The larvæ feed on minute particles of vegetable matter in the water and after a period of growth lasting about a week, when conditions are favourable, during which the larvæ moult their skins several times, they pass into the pupal or nymphal stage. The pupa is more rounded up than the larva and has the appearance of a small pea which has started to sprout, the sprout corresponding with the tail of the pupa. Mosquito pupæ are very active and come to the surface to breathe through the two breathing tubes with which they are provided. Pupæ, though active in their movements, do not feed. After a few days in this stage the pupa suddenly flattens itself out at the surface of the water, its skin splits down the back, and the adult mosquito slowly climbs out on to a piece of floating stick or leaf or a blade of grass. There it rests for a short time till it dries and hardens and then flies away in search of food and shelter. No further growth takes place once the mosquito has emerged from the pupal skin.

Breeding-Places of Mosquitoes

Mosquitoes of all kinds lay their eggs on water, but it has been observed that their selection of breeding-places varies widely in different species and genera. Those belonging to the genus *Aedes* (*Stegomyia*), the tiger mosquitoes, are essentially domestic in their habits and show a marked preference for water collections in tree holes, old tins, broken ghurras, and other artificial receptacles in and around houses. *Culex* mosquitoes frequently breed in foul dirty water such as is found in cess-pools, drains, gully traps, and collections of filthy waste water in the vicinity of houses and stables. Anophelines, on the other hand, usually have a definite preference for clean fresh water, and especially is this the case in regard to the species which are known to be the most dangerous malaria-carriers. The larvæ of some species of Anophelines appear to prefer still water such as occurs in pools and swamps, wells, cisterns, or ornamental tanks, while others prefer gently flowing water such as occurs in streams or irrigation channels. Some species choose their breeding-places in the sunlight, others prefer dense shade. One particularly dangerous species breeds almost exclusively in salt or brackish water.

Habits of Mosquitoes

The female mosquito alone is responsible for the spread of malaria. The male, having no biting mouth parts, is unable to pierce the skin, and is therefore unable to suck blood like the female does. Male Anophelines are short lived and sustain themselves on vegetable juices, while the females, under favourable climatic conditions, may live for many weeks, during which time they may make numerous blood meals on animals or man, and may lay several batches of eggs. As has been said, different species of Anopheline mosquitoes differ widely in their feeding habits. Some species feed almost exclusively on wild animals, while others prefer the blood of domestic animals, and rarely attack man. Others, including the most dangerous malaria-carriers, show a definite preference for human blood.

Anopheline mosquitoes are most active when the relative humidity is high. During the daytime they take shelter in dark places such as may be found in cow-sheds and stables, where they rest on the thatch, under the leaves of trees, in the darker corners of dwelling-houses, and, in short, in any convenient situation where they are ensured protection from sunlight, cold, and wind. Mosquitoes are most voracious in attack just before sunrise and just after sunset.

A question of great importance is the range of flight of mosquitoes. As a general rule, it may be stated that a mosquito will

only fly far enough to obtain a blood meal. If this can be had close at hand, the mosquito will not take the trouble to go further afield; but, if there is no suitable source of blood near by, mosquitoes will fly considerable distances to obtain it. Probably a distance of a half to one mile represents the average limit of flight; but, where winds are favourable, breeding extensive, and habitations scanty, this distance may be considerably exceeded.

Another question of considerable interest and importance is the manner in which Anopheline mosquitoes carry over the winter in places which have a long cold season. Here again different species appear to overcome this difficulty in different ways. In some cases, the winter season is passed in the egg stage, in others the species is carried over in the larval stage. Mosquito larvæ have actually been thawed out of ice, and have subsequently been reared to the adult stage. Other species spend the winter months in the adult stage. The males die off, but the females hide away in warm, damp, sheltered places and remain inactive throughout the winter. Similarly, in the very hot, dry months of the year, when the climatic conditions are unfavourable for mosquitoes, the adult females hide themselves away in the most suitable places they can find and remain inactive till conditions are more favourable for them before coming out to resume their activities and to propagate their species.

MALARIA AND AGRICULTURE

In some parts of the world mosquitoes become a great pest, and the local inhabitants have something to fear from the annoyance caused to their live stock by swarms of these little insects. It is said that in Alaska mosquitoes appear in countless hordes in the spring, but here they render the local inhabitants a service. At this time of the year, on account of the thaw, the ground is unsuitable for the pursuit of game and the rivers are unsuitable for fishing so that the inhabitants, who have exhausted their winter store of food, are grateful to the mosquito swarms which attack the wild animals with such ferocity that the poor creatures are driven to the rivers in a state of madness, often blinded by mosquito bites, and thus become an easy prey to the starving inhabitants. In India, however, the agriculturist has little to fear on account of his live stock, but much to fear on behalf of his family and himself. There is no sadder sight than a village incapacitated through malaria. The malaria problem in India is essentially a rural one, and affects the agricultural classes more than any other community. Malaria does occur in large cities, but there the problem is a comparatively simple one since the conditions are such as to render the breeding of dangerous Anophelines more restricted than

in rural areas. Malaria in cities in India is spread almost exclusively by one species which selects wells and cisterns in which to breed. It is therefore a practicable proposition to take measures against it, and the cost per head of population is not prohibitive. It is regrettable that religious and others prejudices have interfered with the fulfilment of this ideal in some of our larger cities.

The problem in the case of the inhabitants of small villages in malarious areas presents greater difficulties. Here we are often faced with the necessity of attacking several different species of Anophelines whose habits and breeding-places differ greatly. We have the means in our power to minimize, and even eradicate, malaria in rural areas; but, apart from other considerations, the cost of preventive measures is frequently prohibitive. In certain circumstances, as, for example, on tea and rubber plantations, it has been found to be a sound commercial proposition to eliminate malaria, and so it is also in carrying out railway construction projects, harbour works, large engineering schemes, etc., that is, wherever there is massing of valuable labour forces. We still, however, lack a means of attack on ordinary rural malaria which would be sufficiently cheap and effective to make a wholesale onslaught on rural malaria feasible. This is the present aim of malaria research workers, and with this end in view careful investigations are being carried out into all the factors relating to the causation of malaria prevalence in rural areas in the expectation of finding a remedy which will be sufficiently cheap and effective to allow of general application.

Among the factors which have been proved to play an important part in the prevalence of malaria among the agricultaral classes may be mentioned economic conditions, irrigation, and wet cultivation, and, above all, climatic conditions, the eccentricities of which are as great a worry to the malariologist as they are to the agriculturist.

It has been recognized for many years that malaria incidence in rural areas is dependent largely on climatic conditions, a factor which is obviously beyond our control. Generally speaking, when the rainfall is in defect, the incidence of malaria is slight, and conversely, when the rainfall is in excess, a bad malaria season follows. We believe that the influence of the rainfall is not so much in the formation of breeding-places for mosquitoes as in the creation of atmospheric conditions of humidity which are favourable for the longevity of mosquitoes. It has been shown experimentally that mosquitoes die very quickly when the relative humidity of the atmosphere is low, while they will survive for many weeks, and even months, when the relative humidity is high. The length of life of mosquitoes is a matter of first importance in the causation of malaria, for it takes a considerable time for a mosquito which has

fed on an infected person to become capable of passing on that infection.

Other factors are of almost equal importance. Economic conditions play a great part in the spread of malaria. Whenever a community is subjected to privations such as insufficient food, overcrowding, exposure, etc., malaria has a greater chanee. Severe epidemics of malaria in the Punjab have been seen to follow years of famine, especially if the rainfall in the ensuing year is in excess.

On the other hand, most beneficial results in combating malaria have been found to follow improvement in the economic conditions of the people. Formerly certain tracts in England were highly malarious, and the disappearance of the disease has been attributed to improvements in the economic conditions among the inhabitants of these tracts in conjunction with advances in general sanitation and increased facilities for medical treatment. Large numbers of mosquitoes which are capable of transmitting the disease may still be found. In Italy the present policy of "Bonificazione" is being carried out with the dual object of improving agricultural conditions and reducing the prevalence of malaria. Such a policy in India would probably be attended with beneficial results. Here probably great benefit would follow the construction of carefully planned irrigation projects with provision for adequate drainage: the prohibition of wet cultivation in the immediate vicinity of towns and villages, and the careful supervision of small irrigation channels.

Rice cultivation has been much studied and discussed in relation to malaria. It has been observed that the relation of this factor to malaria varies very widely in different localities. In some places rice cultivation is accompanied by very high malaria incidence. Such places include certain areas in Bengal where the rice fields are covered by only a few inches of water, the rice fields in the foot-hills where rice is grown in terraces, and certain parts of Sind where rice is cultivated on the "Pancho" system. In other cases where rice is extensively cultivated the incidence of malaria is only slight, as, for example, in those parts of Bengal where the crop is grown in several feet of water and in those parts of the Central Provinces where there is no associated irrigation.

The effect of irrigation on malaria is an exceedingly complex question and is outside the scope of this article. It may be said that it is at once beneficial and harmful. Undoubtedly, by improving the economic conditions of the people, it has a beneficial influence. On the other hand, it is dangerous when waterlogging occurs, and the smaller irrigation channels are almost invariably suitable-breeding places for dangerous malaria carrying mosquitoes.

IMPORTANCE OF KEEPING RECORDS

M.E.Boie*

Going about in the dark is usually hazardous. An engineer who controls the throttle of a locomotive of one of our fast passenger trains may most seriously jeopardize the lives and the property of passengers as well as destroy the property of the company which he serves, if, while the train is moving, he fails to keep on the engine head-lights.

Records: Business Head-lights.

In a business of any kind, records (ledgers, files, etc.) are the head-lights and beacons. The importance of record-keeping in an organization is everywhere recognized and admitted. The fact that their need and importance are conceded does not, however, mean that individuals and business organizations are thoroughly alive to their own needs in this connection. That anyone should attempt to pilot the affairs of a concern engaged in business, without having adequate records of all accounts and transactions, is hard to imagine. But, if we were to make a survey of the systems or methods in practice generally, we might find the situation not too encouraging. It will be generally agreed that, to give some direction to business, without the benefit of facts disclosed by a well-kept system of books and records, is just as impossible as it is to travel with any degree of safety and speed at night without lights.

We realize, of course, that figures may be misinterpreted, and that the plan of action based on such wrong conclusions may, if carried out, prove embarrassing, if not disastrous. However, this misdirection cannot, of course, be charged to the facts and figures contained in the books and records. Facts and principles will always remain the same, but reasoning may be inaccurate and unsound. We know that there is a lot of scoffing at statistics, and the statistician, as such, supplies the comedian with his certain quota of jokes. But accurate statistics, that is, accurate records, cannot be laughed out of court.

Records Explain.

Considering the importance of records and record-keeping, it may be profitable here to offer a quotation from a patriotic address of a great American who lived during the stirring days of the Revolution:

"I have but one lamp by which my feet are guided, and that is the lamp of experience. I know of no way of judging of the future but by the past."

He might have added, "And there is no way of explaining or interpreting the present except by the past." There are two

**Land O'Lakes News*—August, 1931.

important principles in business that are most profitable to remember. We may profit by our own experience, and we may also profit by the experience of others. If a business is to prosper and to succeed, it must recognize these two principles, and constantly practice them. The two-flame lamp of experience is the only lamp that will provide light sufficient to clearly reveal the right way. In a business organization, it is recorded experience that proves of first value. There can be only two good reasons for the keeping of adequate records: the one is to satisfy the individual, if the business is individually owned; and to make a proper accounting to those in authority, if it is corporately and co-operatively organized, that the business is, in the light of past and present facts and figures, being conducted profitably and successfully.

Books Reveal the Facts.

The foregoing quotation from Patrick Henry was not made at random. If the methods that have produced present results are efficient and sound, the facts and figures of the books and records, past and present, will reveal it. If, on the other hand, results have not been profitable, and the business is either at a stand-still or has suffered reverses, only the records can disclose the reasons for it. A business periodical just off the press gives us this statement: "Any informed person will readily admit that efficient and human analysis of records kept are the most marvellous trail blazers to better performance." The average business to-day cannot be satisfied with merely maintaining its present status, that is, remaining stationary. If planning is not a matter of increasing the volume of business, it must always be a matter of improvement and increasing efficiency.

We recognize the fact that, strange as it may seem, there are individuals who can see no value in history or historical records. If it is true, as quoted, that there is no way of judging of the future but by the past, then a study of the past must be of the first importance. Perhaps we may say that the present conditions of the depression we are now trying to combat are due fundamentally to our either having ignored or having misinterpreted facts brought out by the records of the past.

Records Reveal Efficiency.

Men occasionally resort to that false old saying, "What you don't know doesn't hurt you any." Let us apply this to the records of a going concern. How would a theory of this kind, if made effective, act upon production and selling, also upon financing? Can anyone form a trustworthy judgment as to whether production is efficient, without figures on raw material costs, value of equipment and cost of its maintenance and operation, cost of labour, and a record of all other elements that enter in? It is not the larger manufacturing and distributing concerns that overlook the need of accurate data. These large corporations would not be in existence to-day if their

management had not recognized cost accounting as a science. Without adequate production records, selling of merchandise would be guess-work, and guess-work usually precedes failure. Of course, there can be no success in selling, without records in that connection, and their analysis.

There are numerous examples of concerns that in the past years have been reported by the agencies in their reviews of failure statistics, that at one time were managed by individuals who had an idea that financing was a matter that needed little or no study, and that, the more meagre the records, the smaller the cost of operation or overhead, and the greater the profits and the probabilities of continued success.

Must Recognize Need of Records.

As we have stated, and as anyone knows, it is not the larger organizations and corporations, as a rule, that fail to recognize the essential importance of complete records. It is usually our smaller concerns.

If an individual fails, his failure may affect principally only himself, and a limited number of creditors. His responsibility is quite largely, after all, a personal or a private matter. When, however, a co-operative organization fails because it has not carefully practised good business methods, such as keeping of adequate records, the results, as we know, are bound to affect greater numbers and patrons.

Evils of Lack of Proper Accounting.

There are many evils that a business organization may practice, either because full and complete records are not studied and analysed. Failure to meet obligations promptly, and to pay more for raw materials than the market will warrant, are two of the outstanding evils of some of the smaller plants. The present financial condition of many corporations can be traced back to conditions among which lack of complete records was one of the principal contributing causes.

We maintain that one of the greatest mistakes an individual can make, from the standpoint both of character and business, is to attempt to fool himself. An individual that acts upon this false notion of life usually, sooner or later bankrupts himself morally and financially. That a business organization, co-operative or otherwise, made up of groups of individuals, should believe that it can succeed by fooling itself is hard to imagine. Still, facts and figures might be submitted indicating in a startling way that this is exactly what some concerns, including the smaller co-operatives, have attempted.

LECTURE NOTES ON INDIAN BREEDS OF CATTLE

Part 2

F.J.Gossip, Livestock Expert, Government of Bengal

Scindi Breed

This is a dairy breed, and in its own district, where colour is not objected to, the cow can be called Dual Purpose. The bullocks used in Scind and Karachi are mostly Red Scindi.

This breed is a native of Scind, and can be found in large numbers in Karachi and Hyderabad and the Indus river districts.

The chief characteristics are—

Colour.—Red to dark red with white spots and markings on dewlap. Any other colour than red shows crossing or mixture. Weight—750 to 900 pounds; Head—Short forehead, broad and protruding, with broad muzzle; Eyes—Clear and alert; Ears—Slightly drooping, smaller than Sahiwal; Horns—Short, thick, uprights; Legs—Short, but well apart; Back—Inclined to shortness, straight and strong; Barrel—Compact, with good depth and well-sprung rib; Chest—Broad; Switch—Long tail, with fine long switch; Udder—Is well held up and developed in front; but, owing to lack in width behind, is not well developed behind; Teats—Of good size, and evenly placed, with fair milk veins.

The cows show good dairy shape, and good milkers are wedged, quiet, and docile, easily handled and weaned. In general appearance they show a clear-cut alert appearance, with good bone and thin skin and fine hair. The average Scindi cow has a good appearance.

There is at present no shortage of this breed, and the supply is equal to the demand, as hundreds of cows can be found in Karachi and Hyderabad. They do well away from their native place, as they have been sent to Ceylon, Rangoon, Dacca, Bangalore, etc., and reports state that they are doing well. During the Great War many cows were sent to Mesopotamia. Herds of this breed are now kept by the Bombay Government at Poona and Karachi; also at Bangalore and Mysore. The average period of lactation is about the same as for the Sahiwal—about 280 days, with a yield of 3,000 pounds of milk, and 120 to 130 days dry.

Good cows of this breed can be purchased at Karachi any day. At the Government Farm at Karachi one cow has given over 10,000 lbs. of milk in a lactation; and, where kept under good dairying conditions, yields of over 6,000 lbs. are now common. The Scindi breeds very true to type, which shows that they have been kept fairly pure.

Heifers are fit for serving, if fed, at about 3 years, and males are fit for service at about the same age.

The males are not favoured, outside their own district, for work as they are slower than typically draught-cattle, but they are quicker and better draught animals than the Sahiwal. Still, this breed is a dairy breed, and should be developed as such; but may be used as a dual purpose where cattle are poor and there is no objection against colour.

The Scindi is about the only milch breed that can now be obtained in any large numbers in the open market at a reasonable price.

Yields of a Herd.

AVERAGE YIELD AT POONA COLLEGE HERD

Lactation	lbs.
1920-21	2,027
1921-22	2,441
1922-23	2,454
1923-24	2,427
1924-25	2,961

(More recent data to be published at a later date

COWS IN RANGOON, MR. STEPHEN DAVIS:

1 cow gave 6,100 lbs. in 410 days.
1st lactation—and 4,000 lbs. in 180 days.

YIELDS OF 8 GOOD COWS AT GOVERNMENT FARM, KARACHI

1st Lactation		*2nd Lactation*	
Days in milk	Yield, lbs.	Days in milk	Yield, lbs.
373	5,647	366	5,158
393	5,152	224	2,392
343	4,944	298	4,073
312	4,922	236	4,140
344	4,759	202	2,377
341	3,423	157	1,719
335	3,421	303	3,727
331	3,070	289	3,792

YIELDS AT AGRICULTURAL COLLEGE, MANDALAY

1st Lactation		*2nd Lactation*	
Days in milk	Yield, lbs.	Days in milk	Yield, lbs.
278	3,103	195	2,166
336	3,087	76	212
218	2,029	238	2,068
330	3,080	259	2,832
255	2,557	378	4,126
269	2,007	455	3,977
300	2,755	292	2,249
286	3,724	425	4,020

AVERAGE OF 16 LACTATIONS, MILITARY DAIRY FARM, MHOW

Days in milk	..	310
Yield ..	..	3,967 lbs.
Days dry ..	..	118

YIELDS AT AGRICULTURAL COLLEGE DAIRY, COIMBATORE

Days in milk	Yields, lbs	Milking average
417	6,651	13·3
221	3,840	17·5
128	2,182	17·0
373	6,767	18·0
253	4,564	18·0
131	2,992	22·7

Good Yield

COW No. 721 AT BANGALORE FARM

Yields, 7,175 lbs. and 7,272 lbs.

WELLINGTON FARM

7,749 lbs. in 278 days.

FILARIASIS

DOUGLAS N. FORMAN, M.D.

Malaria has long been a household word in India, responsible as that disease is for so much fever, anæmia, ill-health, and inefficiency. There is, however, another word which investigators in various parts of the country are beginning to show deserves to share with malaria the prestige of household familiarity as a cause of cause of sickness, and that is "Filaria."

The incidence of filarial disease is at present incalculable. Its ravages have been traced throughout vast areas of the tropical and subtropical world; parts of Southern Europe, India, China, the Pacific Islands, Australia, the West Indies, and many of the other tropical lands are known to be infested. In our own province Fyzabad, Gonda, Bahraich, Basti, Gorakhpur, Jaunpur, Azamgarh, Ballia, Ghazipur, Benares, and Mirzapur are the districts most heavily infested.

The cause of this malady, known as Filariasis, is Filaria bancrofti (Cobbold, 1877), a long slender worm. The male is considerably smaller than the female—the length of the former (male) being approximately one and a half inches, and that of the latter (female)

three to four inches; while the breadth of the male is about 1/200 of an inch, and that of the female about 1/100 of an inch. The female, lodged in the tissues, gives off embryos (*bachche*) or microfilariæ, which, at the time of birth, are about 1/125 of an inch in length, and can easily be seen with the low powers of the microscope, and in fresh bloods smears appear as wriggly little snake-like bodies causing considerable disturbance of the red blood cells.

Various questions naturally arise in one's mind: What harm do these filariæ and their active progeny do in the human body? Where do they live? What symptoms do they produce? How is the disease transmitted? And, above all, is there any cure for it?

In addition to the "blood" or "circulatory" system, with which we are all familiar, there also exists a delicate network of fine channels which permeate every nook and corner of the body, and is known as the "lymphatic" or "white blood" system. The larger channels of this system converge at various points, such as the groins and armpits, and empty into filtering stations which are called lymph nodes or lymph glands (*giltian*). Now it is for this network of delicate channels—the lymphatic system—that the filariæ seem to have a predilection; and, when they lodge at the filtering stations, they may cause a variety of troubles, depending on their number and location, by producing inflammation (*sujan*) and blocking the flow of the white blood (lymph) stream. The commonest of these manifestations are swelling of the legs, known as elephantiasis (*fil paon*), and swelling of the scrotal sac, known as hydrocele. With a former, any person who has lived in the districts east and north-east of Allahabad is only too familiar.

In addition to these localized swellings and inflammations, however, which occur in a comparatively small proportion of filarial subjects, there are many less evident troubles which are probably attributable to the elaboration of a mild poison or "toxin" that is given off by the females at the times when millions of their little embryos—the microfilariæ—are born and distributed throughout the blood stream of the affected person. Repeated attacks of chills and fever, periodic headaches, general aches and pains, malaise (*susti*), and nervousness are some of the complaints made by persons who are found to be harbouring the adult worms and their numerous offspring. And these symptoms may exist, with or without the more prominent signs of hydrocele, elephantiasis, fugitive swellings and abscesses in the muscles, and fleeting red inflammations of the skin.

There is one interesting and strange phenomenon connected with the life history of the little embryos which is intimately associated with the question of diagnosis, and that is that they are usually to be found in the peripheral blood—the blood taken from the skin—at night only. In the daytime they hide away in the

deep vessels of the chest. So far, no adequate explanation has been given of this peculiar periodicity. At about 6 p.m. the embryos begin to appear in the blood taken from the finger or ear, and the number steadily increases till 12 or 1 at night; then the tide ebbs, and by 9 a.m. few can be found. So that, as a rule, in order to make a definite diagnosis, the patient's blood has to be taken at midnight after he has slept for a couple of hours. This imposes a slight technical difficulty, which perhaps, more than anything else, has been responsible for the professional and popular ignorance with regard to this prevalent disease. However, during the past three years we have persuaded about 3,000 patients to bring in specimens of their "night blood" and 10 per cent were found to contain microfilariæ. A number of these were students residing in the hostels; and, because of the risk of infecting others, they were asked to take rooms elsewhere. In a recent survey of the members of the first form 22·5 per cent of those examined had defects of the generative organs—low-grade inflammations of the testicle, its surrounding envelope, or of the spermatic cord. It is our conviction that a certain, at present indeterminable, proportion of these defects is due to the lodgment of filariæ.

How is this disease carried from one person to another? By the female mosquito of the Culex fatigans species chiefly. She sucks up the little microfilariæ in her meal of blood from some victim of the disease. These go through a cycle of development in her body, and after 15 or 20 days are ready for their new host—some healthy unsuspecting individual—or even their former host—the patient himself. A number of the embryos collect just behind the delicate membrane under the mosquito's "chin," and, when she stings, instead of passing down the proboscis (sucking organ), they break through the membrane, land on their victim, wriggle through unbroken skin in the vicinity of the puncture, and reach a lymphatic vessel. Up this they squirm to the nearest filtering station (*gilti*); there they grow to maturity, block the lymph vessels, and, in their turn, produce swarms of embryos, incidentally too, discomfort and ill-health for their host.

How can these parasites and their teeming brood be dislodged once they have gained entrance to the body? Unfortunately, although scores of investigators are working on the problem in various parts of the world, as yet no specific has been evolved which will eradicate the filarial worm. However, intravenous (given into the vein) injections of some of the salts of antimony seem to have a deleterious effect on the embryos, and a course of such injections apparently gives many patients relief from their most trying symptoms. Needless to say, surgery is the only thing which will rid a patient of hydrocele and some of the other more evident manifestations, though it does not eradicate the cause.

Far more important for us, however, than the question of treatment is that of prevention. Since filariasis is transmitted by one of our commonest species of mosquitoes, we have still another argument in favour of carrying out those measures of personal and community hygiene which will rid us of these pests, or at least prevent us from being bitten by them.

1. As far as practicable, abolish all bodies of water—large or small— and pour a little oil (one teaspoonful of kerosene oil to each square yard of the surface) regularly on that which is not needed for drinking purposes, and which cannot be abolished.

2. Use a mosquito-net all the year round.

3. Should a member of the family have filariasis, give him a present of a mosquito-net, and urge him to use it, so that he will not infect the household herd of mosquitoes, and, through them, the other members of the family.

4. Do not keep household servants who have filariasis. If you suspect a servant of having the disease, make arrangements to have his night blood examined.

5. Do not live in a house with a filarial subject longer than you have to.

6. When you finally choose your place of abode, settle in a section of the country which is not filarial.

FRESH BLOOD

CAVAS JUSAWALLA

The term "fresh blood" has become so common with the poultry-man, and he has read or heard so much of its advantages, that, without understanding the principles underlying it, he enters into it headlong at the risk of ruining his stock. We know that, by adding fresh blood, the vigour of the stock is improved; in other words, it is done to stop degeneration and deterioration. To introduce fresh blood at the sacrifice of strain, as I find done here, is ruining the stock sooner than it would otherwise. By fresh blood it does not necessarily mean mating unrelated birds; this is what many think; that a male that has no blood-relation with the females should be got; this washes away years of trouble of establishing a strain. In fact, cocks or cockerels that have been specially bred for breeding purposes, and those that belong to the same strain, should be introduced.

Always get your stock from a reliable breeder—a breeder who does trap-nesting, who can show you the records of his birds, who has established or has a strain and means to stick to it. This will not only help you in building a sound pedigree stock of your own,

but also in getting fresh blood from a right and reliable source in case you cannot do your own trap-nesting and breeding.

To buy a pair of prize specimens from a show and mate them to establish your own stock is not always the right thing to do, especially if you are going to seek for fresh blood outside; it is otherwise if you are going to do the breeding yourself, have your own breeding stock, and wish to establish a strain of your own.

I, for one, would never cross good strains; some strains have been brought to such perfection, built so delicately ideal, that anyone trying to improve or experiment upon them would surely spoil them. Why then should time, money, and energy be wasted in trying to bring down a beautifully-erected edifice and trying to raise it again like what it was? This is what is happening here, and I give this article in the hope that we stop this practice soon.

Fowls are imported yearly; for a season or two you hear of them, and they are no more. Why? Because fresh blood was introduced the wrong way; a champion from some show, with a line of cups and certificates behind him, was purchased for a fancy price, and mated to a harem of queens having nothing to do with him.

I do not mean to say by this, and I do not want the poultry public to understand, that it is injurious to mate unrelated birds at every stage of breeding—in fact, this is the way the best strains have been built up. One has got to practise this till all the desired qualities and points one wants his flock to have are obtained, after which the aim of the breeder is to establish these qualities or points in the flock which, in turn, transfer to the coming generation and so on till the qualities are almost stamped, *i.e.*, agreater percentage of the offspring possess the qualities they are bred for and turn out better specimens than the parents. The qualities bred for are: Colour, vigour, shape, build, comb, laying capacity, gait, etc., for which "in-breeding" or "line-breeding" is quite necessary; that is, mating and getting the offspring of related birds, mother and son, father and daughter, selecting and culling and breeding from the best of the lot. It is by in-breeding that LordDewars, TomBarrons, and Ransfords have become household words among the poultry public. To try to improve such strains as these is no one's work except the man or men responsible for the birth of that strain. It has taken them years and generations of breeding to establish; they are working at it still; why not make the most of it by getting "fresh blood" direct from them than by mixing and spoiling the stock? Yes, I understand that we are not all so well placed as to import directly; but a breeder should, who, in turn can, supply from his stock to others. Unfortunately, we have very few breeders here who stick to one strain;

it is very difficult, and one can never sure of getting the right bird when required.

From my practical experience I have found that, when strains are crossed, many unlooked-for qualities are apparent—the change in the offspring is quite marked; one does not find a gradual, but a marked, contrast between brothers and sisters. Some will have excellent points, others quite inferior. With a pure strain it is not so—there will be a gradual change. It is not that the two best specimens of a particular strain, when mated, will always give offspring like, or better than them; much depends on the prepotency—the power of the parents in stamping their qualities on the progeny; neither is it that by mating unrelated birds of good qualities you get poor results; in fact, good results may be bad; no hard-and-fast rule can be drawn when breeding; much depends on environment and fecundity; yet, after experiments, it is found that it is best to keep to a particular strain and avoid crossing good-established ones.

THE MANUFACTURE OF INDIAN SWEETS

N.R.Joshi

Among the ordinary methods of utilizating milk which have been practised for any length of time it may be said that the sale of milk for direct consumption is the most adopted, and the most lucrative. This method of distribution is followed widely wherever there is a dense population, which causes a large demand for fresh milk. The price, depending upon supply, is always as high at least as the average price obtained by manufacturing this milk into butter or ghee in the country. The lowering of the price, due to one reason or another, tends to extend the market, and also, under these circumstances, the problem of manufacturing milk into other products, with a longer keeping quality, arises. This deferred disposal of milk into a manufactured product tends to control the supply to a certain extent and helps in maintaining a higher level of prices, and consequently better returns in the business. In India the dairy industry is in the hands of ignorant gowallas, who, though clever, are not shrewd, and are completely lacking in forethought and organization. The result is that the supply of milk is completely unregulated, causing the market to be glutted during certain seasons of the year, mostly dependent on the supply of fodders, and thus creating a cut-throat competition amongst the producers, which naturally lowers the price to rock-bottom level. This helpless situation of the producers does not in any way result in favour of the consumers. But,

unfortunately, a narrow-minded clique of traders avail themselves of this opportunity and make the best use of it in filling their pockets. This is the class of halwais, or sweetmeat-makers. This class, by advancing petty sums to the producers, the gowallas, who, on account of their lack of forethought are always anxious to receive loans on any terms, gets them in its firm grip, and drives the prices to its lowest level all the year round. While, on the other hand, the halwai, by turning this milk into different sweets, always gets the highest price from the consumers. Under these circumstances, the gowalla has hardly any incentive to improve the condition of his cattle. He is always anxious to get as much as he can out of them by giving as little as he can to them. The result is a continuous deterioration in the condition of cattle from year to year and generation to generation. On the other hand, the consumers are shockingly indifferent to the quality of milk and milk products as long as they get their products at the cheapest possible prices. Under these circumstances, it is surprising how the dairy industry is holding its own in India. To us, this is a clear indicetion that the dairy industry has immense possibilities in India. Only it needs organization on a sound economic basis. **It is high time now that our educated classes should turn their attention towards this industry.** In the United States, which is one of the leading agricultural countries in the world, it has been definitely proved that dairying is the most paying section of agriculture. There is no reason why in India, where agriculture is the main occupation of the population, the dairy industry should not thrive.

Whenever educated young men in India took up dairying as their career, in 90 per sent of the cases they had to face disappointments, principally due to the fact that they had not the necessary back-ground of proper training in dairying. Those who had this necessary background had to face some other difficulties. Owing to unfair competition amongst the producers the price level is always forced down. Also on account of the indifference of the consumers as to the quality, price alone has been the deciding factor in the sale of this product. The result has been low prices, and hence less margin of profit in the business. But even more important than this has been the factor of utilization of surplus milk. Success in dairying depends upon the efficient utilization of its by-products. In Western countries some of the recognied standard methods of utilizing this surplus are to manufacture milk into cream, butter, ghee, cheese, cream cheese, casein, dried buttermilk, ice-cream, condensed milk, etc. But unfortunately, in India, some of these products, such as cheese, casein etc. have no ready market. But the indigenous way of turning milk into sweets, for which there is a ready market, is one of the unprobed openings of immense possibility. This indigenous industry

has been developed to a certain extent only in India. No other country in the world knows anything about this industry; but, as we have said above, this industry of manufacturing sweets is in the hands of a narrow clique who, as in every other industry in India, are illiterate, conservative, and unwilling to give out their trade secrets to an outsider.

With this end in view, of utilizing the surplus milk to its best advantage according to some indigenous way, the Agricultural Institute at Allahabad has started the investigation of manufacturing Indian sweets and standardizing them on a scientific basis, such as has been done with some of the dairy products such as cheese, etc., in Western countries.

In the series of articles that follow we propose to give the process of manufacture of these Indian sweets. We do not- however, want to convey the impression that our readers would be experts in making sweets by reading these notes only, because, after all this is an art which can be acquired only by experience and practice. The Agricultural Institute Dairy would be glad to offer this opportunity to those who are interested in manufacturing Indian sweets.

THE STORY OF MILK MANUFACTURE IN THE UDDER.

W.J. Hansen.

Milk has long been used by man as a source of food. Its use is indicated in the earliest records of history, a fact that proves its use at even an earlier period. *We have come to believe that there is no substitnte for milk.* Young and old depend upon it at some time for growth and the maintenance of health.

The wild cow undoubtedly produced only enough milk to rear her calf. Possibly 1,000 pounds of milk was a good yearly production. To-day we find that the dairy farmer has developed cows whose production far exceeds 1,000 pounds. The average cow in the United States now usually produces about 2,500 pounds of milk. While this is far above the production of the wild cow, it is still below what may be expected. There are thousands of cows which produce between 10,000 and 20,000 pounds a year, Recently a record of better than 37,000 pounds was produced. This means that more than 100 pounds a day were required day in and day out for a year's time. The production of so much milk stirs our interest in the efficiency of a plant or machine of such enormous capacity. Surely the cow is such a machine, and the story of milk manufacture is fundamental to our knowledge of the dairy industry.

Definition of Milk.—Milk may be defined as the normal secretion of the mammary glands of all species of mammals, as food for the young.

Ordinarily the word "milk" without other specifications refers to that of the cow. It makes no difference, however, from what species of mammals the milk comes; the fundamental characteristics and constituents are the same. All milks contain the following constituents in greater or less amounts:—

Water;	Albumin;
Fat;	Ash (Minerals);
Milk Sugar;	Gases;
Casein;	Enzymes; and

Colouring Matter.

These same constituents, when considered as food, may be classified as water, carbohydrates, proteins, and ash. As such they are the same kinds of compounds as are found in the feed the cow eats; but, as we shall find later, there is a great variation between the milk produced and the feed which the cow eats. A detail study of the composition of milks of different animals will be given in succeeding articles. In relating the story of milk secretion, however, it will be desirable to keep this general statement of milk composition in mind.

The anatomy of the mammary gland, and of the cow's udder in particular, has been carefully described and studied for some time. The explanation of how milk is manufactured has been quite puzzling, and many theories have been advanced from time to time, only to give way later to some new explanation. The latest, and most accepted, theory will be presented here.

How Milk is Manufactured.—If we examine the structu.re of an udder, we find that it is divided into two distinct halves A further less distinct division of the halves is found giving the quarters. Attached to each quarter is found the teat, which is simply a hollow tube through which passes the teat canal. At the top of each teat is a cavity known as the milk cistern. If we examine the walls of the milk cistern, we note the presence i of many openings which are the outlets of the milk ducts. The mlk ducts branch up and out into smaller and smaller very minute tubes which literally permeate the milk-secreting tissue and lead ultimately to the milk-secreting cells. It is in these tiny microscopic cells that the milk is actually manufactured. These little laboratories or manufacturing plants are collectively known as alveoli. Here the raw materials are brought by the blood, which, in turn, has been supplied by the digestive processes. The udder cells are surrounded by innumerable small blood vessels called capillaries, which bring the blood to every part of the secretory

tissue. The raw materials in the blood are able to diffuse or pass through the thin walls of the capillaries into the gland cells. In these cells these substances are chemically changed into milk, which passes from the inside of the cells into the milk ducts or tubes down to the milk cisterns, from which it is drawn at milking-time or is sucked out by the calf.

It might be well to note that the milk cannot flow out of the udder or teats of its own accord. There is a banding muscle at the end of the teat which keeps the orifice tight. A similar muscle is found at the upper end of the teat canal at its entrance into the milk reservoir or cistern. The manipulation of the teats and udder in hand-milking or machine-milking simulate the sucking of the calf in removing the milk past these muscles.

Extensive experiments by the U.S.Bureau of Dairying have proved quite conclusively that milk secretion is a continuous process, and that it is quite possible to have 85 per cent of the total amount of milk for the milking stored in the udder before milking starts. This takes us back to the commonly-expressed-idea of the farmer who admires this or that cow because of the "big bag of milk" she carries previous to milking-time. This distension of the udder is a common observation. Adherents of the former theory of milk secretion said it was due to the gorging of the udder with the blood carrying the materials for milk manufacture.

Experiment Disproves Early Theories of Secretion

A quotation from the recent work of the U.S.A.Dairy Bureau is of interest, and shows how the former theory of milk secretion has been disproved: *"At ten o'clock on the morning of April 27 she was killed and immediately hoisted for bleeding. As soon as bleeding was complete she was lowered to the floor. The udder, together with an area of the skin, extending from about 8 inches anterior to the front attachment to about 8 inches posterior to the rear attachment and from thigh to thigh, was then removed in such a manner that the gland tissue was not cut or injured. It was immediately attached to a specially-designed-iron frame, the position of the udder being adjusted until it was approximately natural for a standing cow. One hour elapsed between the killing of the animal and the completion of the adjustment of the udder on the frame.

"At eleven o'clock, twenty-five hours after the previous milking, the milk was drawn into a bucket in the usual manner, and with approximately the usual ease and rapidity. The quantity of milk obtained from the udder thus severed and suspended was

* Swett, W.W.—*Journal of Dairy Science*, Volume X, No. 1, Page 6.

9·2 pounds. The udder was permitted to hang in the same position for four hours until 3 p.m., when a full pint of milk (1·07 pounds) was drawn with comparative ease. A total of 10·27 pounds therefore was drawn from the udder after all body connections had been severed. Since the blood and lymph circulation, the nervous system, and all other body connections were severed before the milk was drawn, there could have been only a remote possibility for milk to be formed during the milking process as a result either of nervous or muscular action stimulated by the udder manipulation. It is obvious therefore that more than 85 per cent of the twenty-four-hour milk production of this cow, as based on an average of the three previous days, was secreted and stored within the gland at the time she was slaughtered."

The many facts available relative to milk formation indicate: (1)it is a process of manufacture, and not one of a filtration of material from the blood; (2) it is to a considerable extent a continuous process; and (3) a large proportion of the milk secured at any milking is collected and stored within the udder before the milking process is commenced.

Milk Production Indices

It is believed that the amount of food a cow can assimilate will influence the amount of raw material available for the blood. For this reason, capacity for handling large amounts of food is looked for by dairy farmers. A large "barrel," or abdomen, wherein the digestive organs largely lie is found in high producing cows.

Vigorous and capacious blood circulation in a high-producing cow is usually indicated by prominent veining of the udder and the abdomen. The large tortuous vein on the abdomen is the "milk vein," and carries blood from the udder back to the heart. In entering the body wall, an opening is made which in everyday parlance is called the "milk well." A large udder full of milk-secreting tissue is another index of a high-producing cow. Such an udder is soft and pliable as compared with a less pliable udder made up mostly of connective tissue and muscle.

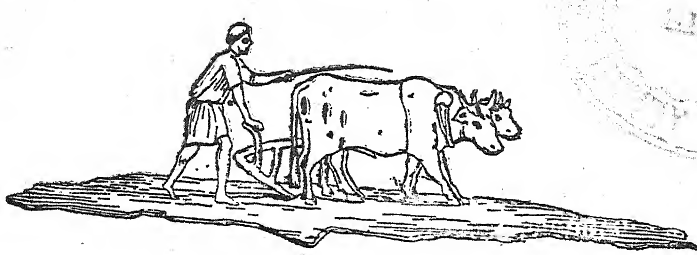
Practically all of the raw materials for milk manufacture are picked up by the blood from the intestines. From here it goes to the liver, then to the heart, then to the lungs, where it is purified, then back to the heart, and thence to the body and udder cells.

The production of milk by the udder cells must be regarded as one of the processes of reproduction. The chief incentives to mammary development and milk secretion are pregnancy and maternity. The stimulation to activity on the part of the gland cells is supposed to be due to a substance in the blood called a

hormone. Some other gland or body organ undoubtedly liberated this hormone, which is carried to the udder in the blood stream. The place of hormone origin is not yet proven. Once milk secretion has been induced or started, it is believed that there is also a nervous stimulus which maintains the milk flow, and which gradually displaces the hormone stimulus. The nervous stimulation results from the food-supply and the treatment received by the cow. It is interesting to note, however, that the initial stimulus never died because, even after all food is taken from a cow, milk flow will continue. It is an example of nature's provision to maintain the young, even at the sacrifice of the mother herself.

Theories of Milk Secretion

The many controversies about the theories of milk secretion involve what actually happens in the gland cells. It was once thought that the milk constituents were simply filtered from the blood to the udder and milk resulted from the filtration process. This theory has been discarded because no such products as milk sugar can be found in blood or anywhere else in nature. The chief protein, casein, likewise does not exist elsewhere than in milk. Milk fat too exists in too great an amount to be derived from the blood fat. That the milk constituents are for the most part manufactured in the udder has been an accepted theory for some time, but it was long believed that the manufacturing process only took place at milking-time. It was believed that the udder could not contain more than a few pints of milk at any one time because the cavities, or milk cisterns, are only large enough to hold about a half-pint each. The milking process was believed to set up a nervous stimulation which telegraphed its message to the cells to start milk secretion. This theory was almost universally accepted by dairy students, and was taught by our dairy instructors until a few years ago.



PRINCIPAL'S PAGE

Principal's Page.

During the last month the Institute has had many distinguished visitors, among them His Excellency Sir Malcolm Hailey, the Governor of the United Provinces. It is always a pleasure to show His Excellency round because he asks such penetrating questions, showing deep understanding and keen insight. His remarks are a challenge to us to fit ourselves better to serve India in the new and larger day.

Last year we were visited by the American Laymen's Fact-finding Commisson. This year they are being followed by an American Laymen's Appraisal Commission. All these are men of large affairs. They too know how to sift the wheat from the chaff. They know what they want, and how to ask for it. Each is an expert in one line or other. While we do not know whether what they found at the Institute met with their approval or no, we do know that their helpful suggestions and friendly criticisms are of great value to us. Because of their visit we should be better able to give education that more directly meets the needs of the rural folk of India. And, if nothing further comes of their visit, we go to our tasks with larger faith, greater perseverance, renewed courage and hope.

There is so much pessimism about in these days, and so much financial depression, that, in spite of low prices for agricultural and dairy produce, it is a joy to state that not for ten years has the Institute been in a better financial position. We have had to retrench and economize. The staff has cheerfully undertaken larger burdens in order to save money; our friends in America have continued to support us, so that to-day we have a smaller debt than for years; it is now less than Rs. 12,000, or $4,000. We greatly rejoice at God's faithfulness and goodness in leading our friends to continue their support in these trying times.

The final year dairy students have begun their Government examinations. We hope that each one will pass.

The dairy now is a joy. The sleek cattle satisfy the eye. The half-breds give such amounts of milk as prove every one a profitable animal, and this in spite of the fact that the price of milk has been reduced. The scientific feeding of silage and green grasses shows that we are producing milk very cheaply. Because India is such a poor country it cannot afford to pay such high

prices for milk as Europe and America. Milk in most Indian cities is more expensive than in the West. So that for a large majority of the people of India milk has been a luxury beyond their financial reach. An abundant supply of good, clean, cheap milk is of great importance to Indian children. By improving the milking capacity of the cow, and reducing the cost of feeding the cow, we are helping to solve this most difficult problem. So to turn out a group of trained dairy-men each year, who have the spirit of service of India at heart, is work that is rewarding.

SAM HIGGINBOTTOM.

* * * * *

Soy Beans Recommended As the Ideal Human Food.

Soy beans, three million acres of which are raised for cattle food and other agricultural uses in this country, have been recommended to the American Chemical Society as the ideal human food by Dr.A.A.Horvath, now of the U.S.Bureau of Mines, Pittsburgh, but formerly in charge of extensive soy bean research at the Peking Union Medical College, China.

Nearly half of the world's total population uses soy beans daily as a protein food, replacing meat. A hundred generations of Chinese have been raised on this source of protein, and Dr. Horvath called this one of the world's most extensive biological experiments. Its protein, or meat-like constituent, is extremely well balanced, containing some necessary amino acids that milk and meat do not provide. Forty per cent of the soy bean is protein, while twenty per cent is oil. It contains all the vitamins and counteracts acids within the body.

Dr. Horvath explained that one pound of soy beans, costing wholesale two cents, contains as much protein and fat as two pounds of beef. A new Austrian process is now being used to remove the beany taste from soy bean flour and make it suitable for wider general use.—*Science News Letter*, 25*th April*, 1931.

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Cow-keeping in India.

Tweed's fifth edition (1931) is now available from Thacker, Spink & Co., Ltd., Calcutta, price Rs. 6-8, with 381 pages and 56 illustrations. The book has been revised and brought up to date by S.N.Sinha, G.B.V.C., B.U.S., Professor of Surgery and Obstetrics, Bengal Veterinary College, Belgachia. An altogether new and valuable section has been added covering the diseases of cattle, goats, and sheep. The books will be found helpful to those interested in cow-keeping.

* * * * *

Feeding and Milking of Cows.

This book, by A.C.Aggarwala, is published by Gulab Chand Kapur & Sons, Lahore. It covers the feeding of cows and their calves, food-stuffs, the art of milking, and a section of appendices, and is worth reading.

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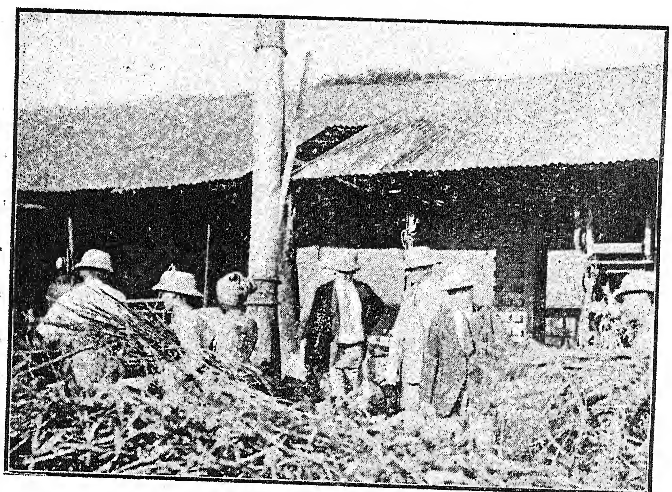

His Excellency Sir Malcolm Hailey during one of his visits to the Agricultural Institute, Allahabad, watching the operation of the silage cutter

THE
ALLAHABAD FARMER

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ACROSS THE EDITOR'S DESK

"What India Really Requires."

We are grateful and indebted to His Excellency Sir Malcolm Hailey for his piercing and clear message conveyed to our readers on the cover page of this journal.

In all walks of life, both in India and abroad, there are diverse ideas as to "what India really requires" of the educationalist, industrialist, evangelist, of the ignorant and educated, of the rich and poor.

* * * *

We have in this message the broad fundamental basis and principle upon which we must act in the future, and it becomes the individual problem of each one of us to study, to plan, and to act so that the real life in India in the villages may be uplifted.

"The great hope for the future lies in the uplift of the agriculturist," not by isolated philanthropists, not by the impact of Western civilization, not by the good-will of a few high officials, but by the deep understanding, sympathetic attitude, and action *of all* in every walk of life—from the upper to the lower stratas of life—from the ruling princes, rajas, maharajas, taluqdars, zamindars, government agricultural department officials, village panchayats, and, finally, the cultivator himself.

"The quickening of interest in rural life and the needs of the countryside" must be evidenced by a return to the countryside of those influential families who have long since deserted the village for the glare and lure of the cities. The villages have long since been largely depopulated of their best brains by the lure of the comforts of the towns and cities. We must return to the village!

The future of India depends upon the uplift of the agriculturist. By himself he is helpless, but by the mercy, good-will, and efforts of those in the controlling and upper strata of life *uplift can be made possible.*

Agriculture and Government Budgets.

Agriculture, along with other government departments, has faced drastic reductions in appropriations in order to assist in balancing budgets. This is the universal cry—"Balance the budget." It is the striking cry of all governments—civic, provincial, and national. It is the cry of all business organizations. Balancing the budget means trying to have expenditures met from current receipts, and not by increasing indebtedness.

Just to what extent can appropriations be reduced without seriously impairing the efficiency of various departments? We trust that experienced heads of departments will keep that question in mind when applying the axe.

There are three points which *legislators* should keep in mind: first, the unorganized state of agriculture (The farmer has no way of passing on the increased burdens placed upon him); second, the responsibility of governments in meeting this unorganized condition; and third, the efficiency and economy with which agriculture in this country has been served.

Agriculture is an industry marked by the highly individualistic activities of its producers and distributers. he farmer can be led, not driven, and progress in agriculture is made only on the basis of good-will and confidence on the part of the farmer toward those who seek to lead him. *This fact is fundamental in any consideration of agrarian policy*, and must not be lost sight of by officialdom.

Governments of all countries are interested in agriculture for two main reasons: first, to ensure an abundant supply of food for their own people; and second, as a means of increasing the wealth of the nation through export trade.

The growth of government agricultural service in all countries has been very rapid during the last twenty-five years. With increasing density of population everywhere, the struggle against plant and animal diseases must become intensified. Greater skill must be applied in production and marketing. Agriculture must be based upon a widespread application of the discoveries of science; in short, upon the knowledge of the technical agriculturists of government departments.

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The Entomologist and Agricultural Problems.

The old idea of an entomologist being a horn-rimmed individual, slightly off his balance, chasing around the country with a net catching pretty butterflies, has largely disappeared. To-day we recognize the entomologist, and especially the economic entomologist, as one of the greatest assets to agricultural research.

Few people realize that the insect type is very many millions of years older than the vertebrate type, of which the human species is the latest development. *Scientists tell us* that human overpopulation of the world is approaching, and approaching rapidly; that birth control is necessary if greater production of plant food cannot be stimulated or if new foods cannot be invented. There is another way of postponing the coming of the starvation era and increasing our efficiency, and that is by the stopping of all *waste*, and better distribution methods.

Perhaps the greatest *agricultural waste* that we have annually is the waste due to insects. They attack our vegetables, fruits, flowers, grains, and animals. Look at the harm that has been done by the corn-borer, the pink boll worm, locusts, etc.

Few people realize that a single common housefly may have 5,598,700,000,000 descendants in 6 months. Thank goodness the larval food is limited and only a small number actually develop!

Insects are dangerous rivals for the food-supplies of the world. They are more dangerous than the possibilities of a foreign invasion. There must be some way of destroying these creatures, and thus minimizing their damage.

The economic entomologist must study our insect pests, and, in co-operation with competent chemists, physicists, botanists, agricultural engineers, and agronomists, measures must be worked out for the relief of humanity. The human species must concentrate on its strongest rivals—*the insects.*

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How Really Effective Improvement in Cattle-breeding can be Achieved.

Before any really affective improvement can be achieved in the breeding of Indian cattle there is necessary—according to Colonel Olver, Animal Husbandry Expert, Imperial Council of Agricultural Research—

"Accurate surveys of the present position;

"Authoritative definition of the distinctive characteristics of the various breeds;

"Some form of permanent control of breeding policy, similar to the control exercised by breed societies over breeding in other countries; and

"*The interest of the more influential landowners and zamindars in live stock improvement.*"

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What does Captain Hickey say about Sheep-breeding Prospects?

"We have found that sheep-breeding is a paying industry, and there is a great future, provided intelligent persons come forward and start sheep-breeding farms as a business concern."—*Captain S.G.M. Hickey, M.R.C.V.S., I.V.S., Veterinary Adviser to Government, United Provinces.*

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Tariff Protection to the Farmer.

For the first time in the history of India the agriculturist has found himself in need of protection in the form of tariff walls against outside competition. The import duty on wheat came just in time to help the farmer against this menace of outside competition.

World agricultural equilibrium has been rudely and badly upset during the last few years by a number of fundamental factors, among which may be enumerated: first, overproduction; second, lack of orderly marketing organizations; and third, monetary, due to some countries insisting upon payments in gold rather than in kind.

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Manure Experiments.

The Director of Agriculture, U.P. (Administrative Report, 1931) reports that manurial experimentation has proved "beyond doubt that bulky manures like farm-yard and green manures are certainly the best, besides being the cheapest. They improve the texture and the moisture-holding capacity of the soil, and their residual effect lasts much longer than artificial chemical manures, which are certainly useful as temporary stimulants. They do not, however, affect the properties of the soil permanently. Best results have hitherto been obtained by castor and nim cakes, especially with such crops as potatoes, wheat, and paddy. Sann-hemp has been found to be the most efficient and cheapest green manure available to the cultivator."

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Goat-breeding.

Goat-breeding has now been taken up on a large scale by Mr.A.E.Slater, of Etah., U.P., with the help of a subsidy from the Imperial Council of Agricultural Research. We are expecting great things from Mr. Slater.

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Agriculture in Java.

In this number we have reprinted Dr.Coleman's impressions of agriculture in Java because he has strikingly brought out a point of view that is all but lost in this country. People generally either have the belief that agricultural research should make some startling discovery and prove

a big windfall to the state, or else that it is a hopeless, unnecessary expense. After reading his article we hope you will agree that there is a pressing need for accurate experimental work by both agricultural departments and individuals, and that you should do something about it.

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Improvement in Growing U.P. Sugarcane.

It is goods news to note that in the U.P. improved varieties of sugarcane now occupy 48 per cent of the total area under sugarcane. The achievement of the Agricultural Department during the last few years in the domestication of Coimbatore sugarcanes in the U.P. is phenomenal. The Agricultural Department, in this one achievement, has justified its policy and the expenditure of full and increased appropriations for continued and increased achievements.

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Feeding of Mineral Salts.

The cattle-breeding section of the U.P. Department of Agriculture reports that the feeding of mineral salts has been adopted as a farm routine, and has now been definitely proved to be beneficial. The mineral mixtures are cheap and the quantity required is very small, while the benefit is out of all proportion to the expenditure. We shall be pleased to furnish full details to our readers upon request.

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Salient Features of the New Agricultural Economy.

Marketing expenses nowadays form a considerable portion of the cost of food-grains, and it is along this line that the most fruitful investigations can be made by the agricultural departments of this country. *The farmer must get a greater share of the consumer's rupee* than he has done in the past. This is a day of shrinking incomes, with expenditures out of line.

Two things are called for: (1) more efficient methods of cultivation; and (2) lower costs of marketing of produce. It is purely an economic problem, and, as such it cannot be hoped that the average agriculturist will be able to do much about it. There is a need for experts trained in agricultural economics to tackle these problems. These experts should be found with the agricultural and co-operative departments. How many agricultural economists are there in India? This is not a future problem; this is an urgent immediate problem that needs solution.

"Our agriculture needs a science to make us intelligent and efficient in our processes of production; it needs a science to make us intelligent and efficient in distributing our production and

adjusting it to the local demand for it." This is the essential relationship necessary between the natural and social sciences in agriculture."

In these terms Director W.C.Coffey, of the Minnesota Station, summed up the relationship of the natural sciences and the social sciences in agricultural education in the U.S.A. at the New Orleans meeting of the American Association for the Advancement of Science.

Farming is a way of living, not a condition of mere existence. The problems of the farmer are those of the home and heart as well as the field.

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Home-lighting Plant.

One of our readers has a home-lighting plant for disposal. It is a style "H" 750-watt plant. The plant cost Rs. 750 to import, but he will be glad to dispose of it for Rs. 550. The plant is suitable for direct lighting or for use with accumulators, but the price given does not include accumulators.

If you are interested, write to the Managing Editor, and he will put you in touch.

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Flavour in Dairy Products.

A study to determine the constituents of milk that contribute to the flavour of dairy products has been in. augurated by Mr. L.M.Thurston. A series of trials has been carried out comparing the flavour of normal whole milk with those of standardized butter-milk obtained from the same batch of milk and with standardized skim-milk from the same original source. Standardization consisted in bringing the content of the butter-milk and skim-milk to that of normal milk. The skim-milk was standardized by adding cream containing fat which was washed 10 to 15 times by dilution and reseparation, and which should contain a minimum of fat-globule films. The butter-milk, already rich in fat-globule, was standardized by the addition of unwashed cream. There was a perceptible graduation in rich flavour for each of the three samples in every case, in the order of standardized skim-milk, normal whole milk, and standardized butter-milk. *This is in confirmation of the theory that fat-globule films do give milk some of its rich flavour.*—*Bulletin* 244, *November* 1931, WEST VIRGINIA UNIVERSITY, MORGANTOWN.

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Frozen Desserts for Summer.

Many "farmers" like ourselves take to "frozen" desserts during the warm weather. In the West the demand in the cities for frozen desserts has created and developed a large industry known as the ice-cream industry. As yet in India, the manufacture of ice-cream, water ices, and the like is being carried out on a very small scale. This year, however, we have noticed more than the usual number of hawkers in the local bazaar. The manufacture of ice-cream on commercial lines has good possibilities in India.

Usually, when the "memsahib" orders ice-cream for dessert, the khansama has his own recipe. Sometimes these recipes are good, sometimes not so good. Many modifications in the way of recipes are possible as to constituents.

In serving all very cold dishes, care must be taken not to interfere with the digestion of other foods. Chilling the mouth hinders the formation and activity of saliva, chilling the stomach retards gastric digestion. The latter effect can be avoided by eating ice-cold food very slowly, so that it is partially warmed before reaching the stomach.

The following recipe for plain ice-cream has been found satisfactory:—

½ cup of white sugar;

1 egg beaten;

1 cup of milk (cow's); and

1 cup of whipping cream (thick).

Make a custard of the milk, egg, and sugar. Let cool. Whip the cream stiff, add to the cooled custard, add vanilla or other flavouring to taste. Set on ice and let freeze. No freezer is required for this recipe. This does not have to be stirred very often while freezing—about three times will be enough. Ice is necessary in order to make this dessert.

[EDITOR'S NOTE:—The Dairy Department, Allahabad Agricultural Institute, will be pleased to furnish further recipes and information to those of our readers who may be interested to write us.]

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Soil Saving Dams or Bunds.

In our next number our Agricultural Engineer will give us an article on some phases of *Soil Erosion in India.* The article will be illustrated. As in the case of the articles on "Septic Tanks" and "Sanitary Cowsheds," blue-prints with specifications will be available at Re. 1 each from the *Allahabad Farmer* office.

If you have any particular soil erosion problem, consult our Agricultural Engineer.

Blue-prints Available.

The following blue-prints are available (at Re. 1 each):—

(1) "Septic Tanks"
(2) "Sanitary Cow-sheds;" and
(3) "Soil Saving Dams or Bunds."

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Architect Service.

During the past year our Engineering Department has been called upon for building plans and estimates for bungalows, servants' quarters, college buildings, churches, cow-sheds, etc. This phase of service by the Engineering Department has been taken advantage of by a number of our readers who are not located so as to secure professional services readily. Let us help you with your building programmes.

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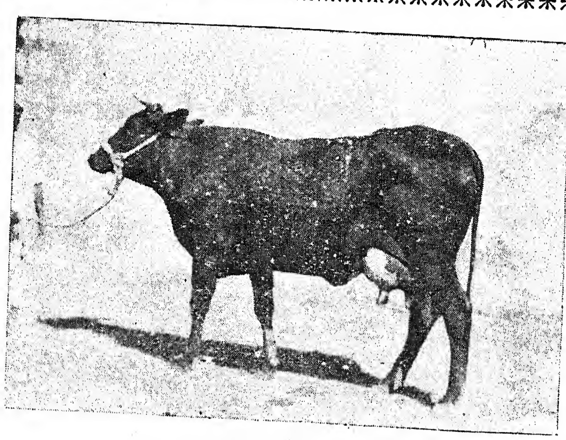
This Cow is Producing 27 Seers of Milk a Day.

At the time of going to press one of our cows, a cross-bred Holstein-Kosi, is producing 27 seers of milk a day. During the lactation period it will go well over 10,000 pounds of milk. Cows of this description are not for sale. They have to be bred. Those of our readers who want to secure a few cross-breds should write to the Dairy Manager for particulars of the special proposition we are making.



Cross-bred Cow No. 10 of the Agricultural Institute, Allahabad, U.P.

How We Have Solved the Fodder Problem.

The last cutting we took of our napier grass plot yielded at the rate of 400 maunds per acre. Due to abundance of fodder on the farm, this plot was allowed to grow somewhat more than usual before cutting. We expect, however, to get at least six more similar

cuttings during the year. The cut shown herewith gives our readers some idea of the luxuriant stand. The approaching monsoon season is a good time to plant out napier roots. If you have not already ordered, do so now. Approximately 16 maunds of roots are required to the acre. A maund of roots will give you

a good start. During the rains the price is Rs. 3 per maund f.o.r. Allahabad. This is a special concession price to the readers of the *Allahabad Farmer*. Send your order to the Managing Editor.

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Village Vocational Training Schools.

There is little doubt but that the system of primary and secondary education in India tends to wean the boys away from the village, and to give them a very impractical training for life work. The system, as such, has largely served its useful purposes, and is now badly in need of thorough remodelling.

The fundamental purpose of primary and secondary education should not be to produce servants for employment in the government services (because there are few vacancies nowadays). *The primary need of such education should be to fit boys and girls to more adequately take their place in village life.*

Should village boys be allowed to go to a high school? In many quarters the idea prevails that education is for everyone, and that anyone has the right to go on to high school, college, and university. It is this mistaken idea that has largely contributed to the present morass in which "higher education" finds itself to-day. Higher

education should only be for the few who have unmistakably shown that they possess ability that it will be of value to the state to cultivate and develop.

There is a need to-day to cut out a great many of the non-essentials from primary and secondary education, and to incorporate real essentials. Those essentials are to be found along the lines of vocational training. In many schools certain phases of vocational training are being stressed as extra-curricula activities, and in many cases these extra-curricula studies place an undue burden on the village boy and girl.

The opportunities for vocational training in village schools will vary from centre to centre because of varying needs. We are pleased, however, to see the stress and emphasis being laid upon such activities as: blacksmithing, tanning and shoe-making, dyeing and printing, road-making, agriculture, and dairying.

During the past decade in India the consciousness of the village has grown, and some of the drift away from the village of the previous century has been checked. Numerous agencies are now engaged in what is called "Rural Reconstruction." We should now, more than ever, concentrate our thoughts on what can be done for the village to ameliorate conditions and make life more worth living in the village.

THE RECLAMATION OF ALKALI (USAR) LANDS

B.M.Pugh, B.Sc. (Calif.)

There are large areas of land in every continent which are not at all suitable for cultivation due to an accumulation of certain salts on the surface of the soil. India, like many other countries of the world, has lands which are called "usar," or unproductive. The farmer in India knows that such spots of land do not even let grasses grow over them. They are in many places absolutely devoid of all vegetation. Such lands have been a cause for anxious thought to many farmers in this country. The agricultural departments have made several investigations with the idea of reclaiming these lands, and some of the investigations have led us to understand the problem at least, and to adopt certain methods which help us to control them. On the other hand, there has also been an increase in the appearance of alkali in certain places which but a few years ago never had any.

It is therefore with the idea of helping the farmer to understand the problem that the following few lines are written.

Soil alkalinity is not alkalinity in a chemical sense of the term. Alkali, in chemistry, is a hydroxide. But alkalinity, in soil management or soil science, is a term used for the incrustations of certain salts, like chlorides, sulphates, and carbonates, or their combinations, or their presence in the soil in such quantities as is sufficient to injure or inhibit the growth of plants.

These incrustations of alkali take place as a rule in semi-arid places. It occurs practically everywhere that irrigation is necessary. Thus it is a serious problem in the Punjab, Rajputana, and Sind and in many parts of the United Provinces where the amount of rainfall is low.

It, however, may be caused through ordinary rock disintegration and decomposition under conditions of aridity. That is, a rock may give rise to alkali salts if the alkali that is thus formed does not seep down into the soil; that is, soil that has been formed by the decomposition of rocks may contain soluble salts, and these salts in humid regions would be washed or leached down into the lower levels, while in arid regions these salts will accumulate. But much of the alkali soil in many parts of India is probably due to the fact that these lands in which alkali appears were at one time under the sea or have been raised or have grown into deltas in what were once the arms of the sea. But a recent increase in the appearance of alkali or the extension of usar spots is due to improper handling or mismanagement of the soil.

Alkalies are generally classed by the farmer as either black or white. Black alkali may be any of these: sodium carbonate, potassium carbonate, or sodium bicarbonate. These substances are not themselves black; but, when these are present in excess in the soil, they dissolve out the totally decomposed matter in the soil, which is called humus and which is dark in colour, and this gives a black or dark greasy colour to certain spots in the surface soil; hence the soil is said to contain black alkali. Sodium carbonate is probably the most common in the United Provinces, and is the most harmful.

White alkali may be any of these: potassium chloride, sodium sulphate, sodium chloride or common salt, magnesium sulphate, calcium chloride, or calcium sulphate. White alkali, as it occurs in this country, is usually the combination of sodium chloride and sodium sulphate. Sometimes, however, these two may be present with sodium carbonate.

The effect of alkali on plants is to influence the absorption of water by the roots of plants; that is, when there is a strong concentration of the soil solution, the water in the plants sometimes comes out through the roots, or, more specifically, the root-hairs. In other words, exosmosis takes place in the plants,

and so the plants are deprived of the moisture necessary for their existence. In such cases therefore it is necessary that the plants be supplied with plenty of moisture around their roots so that the strength of the solution is decreased. Black alkali is also more injurious because, unlike the other alkalies, it has a deflocculating effect; that is, it breaks up the combination of soil particles into smaller particles. This has a tendency to make the soil which contains black alkali impervious to water, which again makes the soil waterlogged; that is, the soil becomes puddled; hence unfit for cultivation. This deflocculating effect also retards the flow of water, and the soil moisture is therefore not readily available to the plants. It has been claimed that water would percolate through "usar" soils only 1-10th to 1-100th as fast as through a good soil.

The problem of removing or of controlling alkali is a very pressing one in this country. In the next few lines we shall suggest some of the methods that have been tried out with some degree of success either in this country or in other countries like the United States of America.

Perhaps the cheapest method of managing alkali lands is by flooding and draining where plenty of water is available. "Bunds" or low levees are made on the land, and the "kiaris" thus made are flooded with water to a depth of about two or three feet and under-drainage is provided for. Draining is, of course, more difficult in the case of impervious soils, which are generally caused by the presence of the black alkali. If tile-drains are to be used, the soil should first be treated with gypsum as this facilitates drainage by making the structure of the soil less compact. In any case, care should be taken that the water will pass away altogether; otherwise, if the water rises again, it may bring a greater accumulation of salts on the surface. Alkali may also be removed by scraping off about three to four inches of the top soil, which always has a higher concentration of these salts than soils at lower levels, and throwing it away altogether. Or, wherever plenty of water is easily available, the alkali may be removed by flushing. This latter method is recommended wherever the slope of the land is just right for such a procedure.

The alkali may also be controlled by chemical means, although these methods are not recommended for large-scale farming as they are more expensive. For instance, the addition of gypsum to a soil containing black alkali would convert sodium carbonate to a less injurious salt—the sodium sulphate. The cost of gypsum, however, is prohibitive for adopting such a procedure. Besides, gypsum is not very soluble in water; hence the change is very slow.

The sodium carbonate may also be converted into the sodium sulphate by the addition of sulphur, or even sulphuric acid. In small tracts these methods have been tried out in other countries and found successful, but these methods would not ordinarily recommend themselves to our Indian farmer since they are very expensive.

"Usar" lands, however, are increasing in this country. And this is probably due to two causes. First, it is probably due to over-irrigation. This is encouraged by the greater facilities for irrigating the crops brought about by canal irrigation. Before the land is irrigated the scanty rainfall which falls in semi-arid regions penetrates only to a depth of say four or five feet. But, with the supply of irrigation water from canals, farmers are prone to use the maximum amount of water. This has resulted in the rise of what is called the "water-table." During the dry, hot summer the water rises several feet through capillary action or by adhesion or cohesion. So, while in former years the moisture which evaporated came from a few feet or a few inches of soil, now it comes through several feet of soil and carries along with it soluble salts to the surface of the soil, where it is left when evaporation takes place. This causes a greater concentration of salts on the soil surface; hence an increase in the amount of alkali. This is taking place not only in India, but also in Egypt, and even in France and Italy. Another reason for the increase of "usar" spots is probably a decrease in cultivation.

In order therefore to prevent the extension of "usar" lands, over-irrigation should be avoided; and secondly, those lands where there is a possibility of the appearance of alkali should not be left fallow from year to year; or, if left fallow, they should be ploughed.

Such crops as lucerne, beet, castor, indigo, and rice may be grown in lands containing some alkali. Lucerne, because of its deep root-system, will grow even where citrus trees have failed. Rice may be grown in places which contain as high as 2 per cent of alkali because water dilutes the alkali solution. Where these have failed, such plants as "babul" (Acacia), "doob" (Cynodon dactylon), certain salt grasses, or "akh," or "mandar" (Calotropis gigantea) may be grown.

DENMARK SEEN BY A FARMER FROM BURMA

BRAYTON C. CASE

Superintendent, Pyinmana Agricultural School, Burma

When a farmer goes abroad, he finds much of interest in every country because, wherever he goes, he finds farmers. However, one of the most interesting countries I visited during my recent travels was Denmark.

It has a larger per cent of its population engaged in agriculture than almost any other country in Europe, and the rural farming people are among the best educated, and among the most intelligent, in following scientific practices in their work, of any farmers in the world. Although it is a very small country, with an area not much larger than some of our districts in Burma, and a population of only about three and a half millions, or one-fourth of ours, still the farmers are among the most prosperous in the whole world. There are almost no poor people, and also very few extremely rich, in the country. It was therefore of interest to a farmer from Burma to note some of the influences making for its prosperity.

One of the institutions which has contributed in a very large measure to the advancement of the country people has been the "volkskole," or people's school. After the young people have left the elementary village schools and gone to work on the farms and gained a few years experience they come back to these continuation schools for part of a year. The boys come for five months in the winter, when work on the farm is slack, and the girls for three months during the summer, when they are less needed in the home.

This type of education was started in Denmark by religious leaders such as Grundtvig and Ludvig Schroder, who sought to combine the impulse of religion with the appreciation of culture and the achievement of science. The movement was started by these men about seventy years ago, and has now become a part of the country life everywhere.

These people's schools are primarily for giving inspiration rather than for teaching information—which is rather different from our conception of a school. There are no examinations and no certificates of graduation. Ordinarily the young people come for only one term. In a number of places there are people's high schools, where they may continue for one or more years longer, three years being the maximum.

The plan of creating in these students this inspiration seems to be by selecting for teachers men of inspiring personality who

are thrilled with the values in the country life, and who have a love for country people. The chief matters taught are religion, history, literature, music, and gymnastics, with the purpose of developing the spirit, mind, and body. The lives of great men in history receive special attention. The students are led to appreciate inspiring men and things in the past and present.

On Sundays, after attending the village church service in the morning, the farmers come to these people's schools for the afternoon and listen to talks given by the teachers, sing songs together, and discuss the topics brought up in the talks. Many of these farmers, when young, had studied in these schools, and in this manner they continue their interest in them, and continue to look to them for inspiration.

From the new view-point received in these schools many of the young people are led to go on to the agricultural schools so as to learn how to create that better country life which they have come to desire.

The common agricultural schools take the young men who have had several years' experience on farms and give them a five-months' course during the winter on soils, growing of the crops common in the neighbourhood, and feeding and care of animals. During the winter course there is very little practical work outside on the land, the lectures being illustrated by class-room demonstrations. For those who can continue longer certain schools have a summer course in addition, making a total of nine months for the school year. In the summer there is more demonstration and practice work outside. All these schools usually have small farms connected with them for demonstration purposes.

At many of these agricultural schools there is another course in dairying in addition, which continues for eight months. Dairying is the most important industry in the country, and careful attention is given in these schools to proper feeding and breeding of cattle and the production of butter and cheese. In the summertime, when the teachers in these agricultural schools are not engaged in school work, they are used to visit the farmers and give them instruction in improved practices and inspiration for a better country life.

A notable feature about agriculture in Denmark is that the farmer gives his chief attention to raising beets, turnips, potatoes, and grass as fodder crops, and buys a large part of his grain feed from across the ocean, and then makes his money by feeding both to his animals and selling the animal products. The manure he puts back on the land, and keeps it very fertile. The animal products he sells in the form of butter, cheese, bacon, and ham at

a good price all over the world, and makes a good profit for himself in the process.

The land is rather level, and, on the whole, very fertile, although part of it has been reclaimed from below sea-level by pumping out the water from behind bunds. However, every inch is carefully cultivated. Very few fences and hedges are seen, and no brush and weeds clutter up the landscape. Where land is not suitable for cultivation, trees are planted. A farmer keeps as many cows as he can feed, which is usually not less than a dozen. These are staked out with short lengths of rope on the grass crops he grows and are moved several times a day. Cattle do not go roaming around destroying the fields of neighbours, as in Burma, and the farmers, instead of standing around watching cattle, are at work growing something for them to eat. The root-crops are mainly fed in the winter, when grass is not obtainable.

The homes of the farmers are as comfortable and clean as a newly-washed dish. Each house has beside it a vegetable garden kept clean of weeds and filled with food for the family, and beside it are a few fruit trees. Everything inside and outside the farmer's house is always kept as trim and tidy as if just fixed up for a party. Doors are left unlocked, and tools stand in open sheds where anybody could take them away. But they told me nothing is ever lost. Prosperous farmers don't steal, and farmers who don't steal and work hard become prosperous.

At the head of the agricultural education system of the country is the Royal Agricultural College at Copenhagen. Here are trained the teachers for the agricultural schools and the scientific experts to man the experiment stations over the country. It is quite distinct from the University of Copenhagen. Near the agricultural college are two experiment stations, and others are located in different parts of the country on which work is conducted in crop improvement, diseases and pests, animal breeding and feeding. They are doing some high-quality work, and the farmers take much interest in the results of these experiments. These scientific experts, however, do not draw salaries much more than what is earned by a good farmer, and their style of living is much the same. The scientific leaders and the farmers are of one class, both socially, in wealth, and in intelligence. They understand each other, and the farmers' needs help to keep the feet of the scientific men down on the ground. The leaders live for the rural people, and the rural people respect and appreciate their leaders.

One of the very outstanding achievements of the farmers of Denmark is the development of co-operative marketing. The farmer concentrates his attention on producing a good product, then depends on his co-operative organization to sell it for him.

Standards are set for different grades of quality, and what he produces is strictly judged by the organization, placed in one of these grades, and the farmer gets the current price of that grade. Naturally, the farmer works hard to get a high-grade product. If he produces milk, he works hard to make it as high in cream content as possible. Then he places it beside the road in front of his house. The truck of the co-operative organization comes and hauls it away, tests it for cream content, makes it into butter, and brings the skim-milk back to his door to feed to his animals at home. At the end of each week he receives a cheque for the amount due him on his milk.

All the farmers belong to the co-operative organization, which is managed by the farmers themselves through their elected representatives. Because all the farm products are marketed through a single large organization the price of butter and cheese from Denmark sets the price for most of Europe. All this wonderful co-operative organization has grown up by the efforts of the people to help one another, and not by the government having to create it and push the people into it. The government has only to co-operate to make the machinery run smoothly. The farmers form the strongest party in the politics of the country, and they run the government too and see that the farmers get what they need.

The general impression one gets from Denmark is that the rural people are wonderfully advanced. They love their country and work loyally together to help one another, and their purpose is to share the highest privileges with the most backward man. The education system for the rural communities is closely tied up with the needs of the farmers. The educators love the rural people, and the rural people look to their schools and educators with confidence and pride.

The spirit of co-operation and good-will everywhere, and everyone working for the good of all, seemed to be the secret which made that little agricultural country one of the great countries of the world. This secret well learned must make any country great.

A NOTE ON THE NOMENCLATURE OF INDIAN CITRUS FRUITS

W.B.Hayes, M.Sc.

In no other group of Indian fruits is there so much confusion in nomenclature—vernacular, English, and botanical—as among the citrus fruits. It is a subject worthy of the attention of someone who can give it the continued and zealous study of Bonavia, but with a better knowledge of botany, and acquainted with

modern citrus classifications. Bonavia, a member of the medical service, published his classic work in 1888, and it is remarkable that since that time there has been no publication covering this field.

It is not the purpose of the present paper to attack this most complicated problem, but to deal with one or two of the common, and more easily-classified species, about which there seems to be some confusion.

It seems strange that there should be confusion concerning the *kagzi nimbu*, which is found in many parts of India, and which in most cases answers very closely to the descriptions, in the most nearly standard classifications, of the true lime. The tree, leaves, flowers, and in most cases at least the fruits, correspond closely. If it is true that in the Bombay Presidency there are varieties with elongated fruits, this alone cannot justify calling this fruit a lemon. Yet this is done in a number of the publications of the Bombay Department of Agriculture. In bulletin 158 of 1929 Cheema and Dani speak of it as the *kagzi* lemon, and compare it with the Eureka and Lisbon lemons, as if it were of the same species. Paranjpye, however, in bulletin 95 of 1919 (revised 1927) calls it a sour lime. In this he is in agreement with the sixth edition of Firminger's "Manual of Gardening."

All of these writers agree in classifying the *kagzi* as Citrus medica, variety acida. Bonavia, however, saw the difficulty involved in making one species include such diverse forms as the citron, lemon, and lime, and followed Roxburgh in calling it C. acida. Modern American usage is unanimous in removing the lime from C. medica. It is generally classified as C. aurantifolia Swingle. There seems to be little advantage in forming a large and complicated species, although this may be theoretically justifiable as indicating a closer relationship between the lime, lemon, and citron than between these and the other citrus fruits.

Another possible reference to the lime is found in W. R. Brown's reports of citrus stock trials. In one of these he writes of the *khatti* as a small sour lime; but, as he identifies *khatti* with the rough lemon in a later report, this does not mean very much. He also mentions a large sour lime, called *khatta*. This illustrates the need of working out a recognized system of nomenclature for Indian citrus.

The *santara* group of oranges has also caused some confusion, mainly because of a tendency to consider it a sweet orange, C. sinensis, Osbeck (C. aurantium). Bonavia saw the desirability of separating these two types, and identified the *santaras* with C. aurantium sinensis of Rumphius, which has since been identified with C. nobilis. However, he was undoubtedly wrong in including

in the *santara* group the kumquat, which is now considered by some botanists to form a separate genus. Loureiro thought that C. aurantium sinensis of Rumphius approached C. nobilis, but did not coincide with it.

It seems queer that later writers in India should classify the *santara* with the *mosambi* and other sweet oranges, but this is done by Paranjpye in Bombay bulletin 95, by Cheema and Bhat in Bombay bulletin 155 of 1928, and by Burns in Firminger's Manual. Barakzai, in another Bombay bulletin in 1918, had called the *mosambi* a sweet lime. In Assam bulletin 2 of 1928 S.K.Mitra places the oranges of the Khasia and Jaintia Hills, which are *santaras*, in the mandarin group. In this he would seem to be correct. There can be no doubt but that the *santaras* more closely resembles the mandarins than the sweet oranges. Foliage, flowers, and fruit all differ from the mandarins and tangerines no more than these differ among themselves. If Swingle is to be followed in dividing C. nobilis into a number of botanical varieties, the typical loose-skinned orange of India might well be called C. nobilis, variety *santara*.

HOW TO RAISE POULTRY FOR PROFIT

Cavas Jusawalla

Every year we hear of so many new poultry farms springing up to fade away like mushrooms in a very short time. The defect generally lies with the man at the helm.

It is generally believed that in starting a poultry farm previous experience and knowledge of the branch are not essential, and that anyone can raise poultry and run a farm. To help them in their belief incubator manufacturers advertise that no previous knowledge is necessary, and that it is very simple to run a machine. It is all well as far as the machine and the hatching part are concerned; the real trouble starts when the chickens are out.

Reading books will help; but book knowledge, coupled with practical experience of hatching, raising, rearing, and doctoring, is quite necessary. Past experience, of whatever kind it may be, will stand you in good stead now when troubles are so many; for with poultry there is bound to be trouble—the more birds the more trouble. A "greenhorn" at this stage finds himself lost; chicks die by the dozen for no apparent cause. Enthusiasm and interest change places with disgust and desolation; soon there are hatred and closed doors. Here the cause might have been gapes, ticks, lock of ventilation and space, and perhaps overkindness in feeding.

If this is his first experience, he will do better next time, but at what cost? Wouldn't it have been better had the start been made with just a few fowls in the back-yard, or if he had taken practical training in poultry for a few months? Another very bad and could-not-be-helped habit of the novice is to rush in for different breeds; it is very difficult if not impossible for an unexperienced man to manage two different breeds. "Could not be helped." I say, "Yes; it is so; birds are very fascinating; what your friend has, or what you have seen at the show, you want. It is natural; but it is later on that you learn, and at a very big price, that it is ruinous." A "seasoned" poultryman would never do that; he has passed all this, and now knows that it is best and most paying to stick to one—just one—breed. There is so much to be learnt in poultry that it is not always possible to know all before starting on your own, but elementary knowledge is quite essential. Here we will start with the new-born chick.

After the chicken is out it does not require any sort of food for 48 to 72 hours; nature has provided it; it has been providing it all these 21 days. The yolk in the egg is the embryo's food; it has been feeding on it during the incubation period, and before coming out into the world it has taken in the remaining part of it. If you feed at this stage, you overtax the system of the chick and establish a cause for complaint. If, however, you must do something in the way of feeding, pure water, with a crystal of permanganate of potash and fine grit, are only permissible.

The first meal should be of pin head oatmeal; it is a bit costly in the beginning, but the best. Feed very sparingly, not allowing any meal to lie about. The best way is to feed just the amount the chicks will pick up readily and at short intervals. Continue oatmeal for the first week; during the second week and after ground wheat, jowar, other millets, bran, hard-boiled eggs, and greens may be given.

Ventilation plays an important part in raising chickens successfully. If too many are kept together in a small box, with the idea that they require warmth, disease will soon set in. Let them have plenty of space, and they will manage the rest. In the Deccan, in winter, artificial warmth is necessary just for the first week; there is no necessity at all for expensive brooders and foster-mothers. I never give artificial warmth when the brood is over 15 in number. If the night is exceptionally cold and the flock under a week old, then a little wool is placed as litter. The chickens are placed in a big, freely-ventilated box. For a fortnight they crowd together, but later on you will see that they prefer being not quite so close to their companions. When they are big enough to roost, let them. It will not bend their breast-bones or give them wry-tail. I allow my birds to roost on perches

when they are 3 months old. Plenty of air and space are quite necessary. Have the floor swept of the droppings daily and washed with phenyle.

With roosting, tick-proof perches come into play. No matter how scrupulously clean the coops are kept, tick-proof perches must be used; they are indispensable, and the poultry-man, with all his sprayers and disinfectants, is surely looking for trouble if he does not believe in them.

The fowl tick is up and doing when the birds are roosting; it sucks the very life-blood of the fowl; night after night it goes on spreading disaster, leaving its victim finally bloodless. There are different kinds of ticks; and, like the mosquito, some are poisonous, and give the fowl a fever called tick fever. After sucking the blood, the tick swells and drops down and by morning is safe in some crevice. A whole article could be written on ticks, their habits, their life-cycle, and the havoc they play, but all this can be avoided if a tick-proof perch is used. The aim of this perch is to prevent the tick from getting to the fowls. It must be known that the tick just crawls; it does not hop like the flea, or fly like the mosquito. It is very simple to get tick-proof perch-stays made. Get two iron brackets, or have them made to suit your particular coop; pass each through brass cups and solder. That is the tick-proof perch ready for use. The best way would be to order a pair from a poultry-appliance firm and get the idea. The cups are filled with kerosene oil, and on the top of the rod to which the cups are attached the perch or a long piece of wood is fixed for the birds to roost on. It must be seen that no part of the cup or the rod above it touches any part of the coop. The tick, in trying to reach the bird, either falls into the cup filled with kerosene oil or returns. Even if the cage is full of ticks, no harm can come to the birds as long as they are on the perch.

Now that the flock is growing satisfactorily and the poultry-man is convinced of the necessity of tick-proof perches, we must raise the birds in such a way as to get something out of them for our trouble and labour. For this the egg basket must be full; which, in turn, depends on proper and scientific feeding. In our next article we will see how proper feeding and balancing of the ration help to raise poultry for profit.

TURKISH AGRICULTURE

RAYMOND F. WHITE, AGRICULTURAL DIRECTOR
INTERNATIONAL COLLEGE, IZMIR, TURKEY

The area of Turkey is approximately 762,736 square kilometres. Anatolia, or Asia Minor, has an area of 500,000 square kilometres. The area of Turkey is six times that of Greece, and its population is 13½ million—18 per square kilometre. The reason for this sparse population is that the country has been a battle-field for hundreds of years. The first regular census was taken in 1927.

Approximately 85 per cent of the population of Turkey depend upon agriculture for their income. There are three classes of farmers in Turkey: (1) those who work their own land; (2) partners, one of which owns the land, the other doing the work and sharing the income; and (3) those who work rented land. The majority belong to the first class. Land-holdings in general are small, 30 dönüm (7½ acres) being the average. Usually the various members of the farmer's family work with him in the field so that outside hired help is not needed. Generally there is grazing land near the village, and all of the cattle are herded together by a responsible youth.

In the vilayets of Istanbul, Ankara, Bursa, and Izmir there are some large farms—2,000 to 20,000 hectares—but in most cases only a small part of such extensive holdings is under cultivation.

There is a wide variety of agricultural products due to climate differences of the different areas. In the coastal regions oranges, olives, nuts, figs, and raisins are produced. Tobacco is the most important exported product, amounting to 40 to 60 million kilos annually. The annual production of olive oil amounts to 20,000 tons. Among the cereal crops wheat takes first place, followed by barley, corn, rye, oats, and rice. Other food-crops, such as beans, peas, horsebeans (bakla), and lentils, are produced in large quantities. Potato and onion culture is increasing.

Cotton is another important product which has been grown for many years in Turkey. There are no large textile factories here; therefore most of the cotton crop is exported. Turkey is justly famous for its raisins, the annual production amounting to 40 to 50 million kilos. Raisins constitute one of the most important exports of the Izmir (Smyrna) vilayet. Aydin may be considered the centre of the fig-producing district, but figs are brought to Izmir for export.

Modern agricultural implements of all kinds are used in various parts of Turkey. The Fordson is the type of tractor generally employed. The government is encouraging the big farmers to buy tracters by paying them almost the full value of the tractors they wish to buy.

Scientific poultry-keeping, as a specialized industry, is undeveloped as yet, but the government and some enthusiastic amateurs are definitely set to put the industry on a commercial basis. A national Poultry and Bee Association is organized, with branches all over the country. There is only a limited number of poultry farms as yet, but there are a great many amateurs who keep poultry and follow scientific methods in their care and feeding. All farmers, and many city people, keep poultry in their back-yards, even though they make no attempt to follow modern methods in their handling of the flock.

With Mustafa Kemal Pasha, the president of Turkey, interested in the agricultural prosperity and progress of the country, and himself having a big model farm at Angora, the future of Turkish agriculture is not without hope.

AGRICULTURAL IMPRESSION OF JAVA*

DR. LESLIE C.COLEMAN, M.A., PH.D.

Director of Agriculture in Mysore

The one thing that impresses me most strongly in a study of agriculture in Java is the very great amount of money and work that is being expended upon experiments for the improvement of crops. The country has been singularly blessed by nature as regards both soil and climate. The soil is on the average very much richer than that of Mysore, while the climate in most of the island exhibits such plentiful and good distribution of rainfall that crops apparently rarely fail. There are exceptions, however, and the present year has seen quite severe conditions of drought in the eastern portion of the island.

One might have supposed that under these favourable conditions it would not be considered necessary to devote much energy towards improvement. This is, however, very far from the case. The government department of agriculture has an expensive organization for experimental work, and this is very largely supplemented by experiment stations for many important crops which are supported by private enterprise. These private organiz-

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ations spend altogether the equivalent of about Rs. 30 lakhs a year upon the maintenance of experiment stations for rubber, tea, coffee, coconuts, cinchona, and sugarcane. The private agricultural organizations in Java therefore spend more on agricultural improvement than the Government of Madras on all of its agricultural operations. They spend nearly three times as much as is spent on agriculture in Mysore. As far as I am aware, there is no doubt in the minds of the agriculturists who put up this large amount of money each year that they are getting a very good return for their investment. So sure are they of this that they are now beginning to restrict the supply of information which is obtained from their experimental work to the people who put up the money for this work.

What are the results? One result has been the production of a new variety of sugarcane which has increased the yield per acre of sugar by between 20 and 30 per cent. This cane, within five years, has replaced almost entirely all other varieties previously grown on the sugarcane-fields of Java. It is estimated that during the present year 98 per cent of all the sugarcane in Java belongs to this one variety—a variety which ten years ago did not exist.

What has been done for sugarcane is being done perhaps to a lesser, but still to a very appreciable, degree for coffee, tea, rubber, and coconuts. All of these crops are, through the introduction of new varieties and better systems of cultivation and manuring, showing steady increases in production.

What is the lesson to us? Our natural conditions are undoubtedly not so favourable as those generally existing in Java. If then we are not to remain in a hopelessly backward condition, or if we are to see our economic condition improve rather than deteriorate, it must be by more intensive efforts towards agricultural betterment. A greater insistence on accurate experimental work on all lines both by the agricultural department and private individuals seems necessary if Mysore is to gain and keep its proper place as an enlightened and prosperous people.

SAN JOSE SCALE IN KASHMIR.

S.Q. VACHOO

The Kashmir department of agriculture has many government orchards under its control which are paying concerns, as well as having educational value for the rural population of Kashmir. The department of horticulture is in charge of orchards, and gives free instruction to anyone who applies to the Director of Agriculture. Assistants go to the spot, and after an inspection give instruction, and then keep in touch with the applicant. There are a good many nurseries all over the valley, and new nurseries

are being started. There is every year some free distribution of plants from the nurseries. Peasants get plants free of cost on presenting "intikhab," that is, showing that they own land. There are some defects with plant distribution, but I am sure they will be remedied in the long run with the help of the agricultural staff. The reputation of this country is marred by the introduction of San Jose Scale, a scale technically called Aspediotus perniseosus. Originally the insect was imported into San Jose valley, California, from China, and thence it was imported to the different parts of the world by nursery stook.

The insect has sucking mouth parts, and sucks the juices of the plant and injects toxic material which kills the plants in course of time. The insect covers all the parts of the host plant. The land under orchards is turning into a wilderness. The nurseries get easily infected by this insect. It is from these nurseries that the disease may go from bad to worse. (I must say that the department of agriculture is taking good care of its nurseries.) I have toured the whole valley, and I can say the valley orchards are suffering greatly from this pest. French apples have become extinct in the village orchards.

The insect passes the winter in the larval condition on the bark of the host plant. The mature scale is small, greyish in colour, and circular in shape. The female scale has a nipple in the centre, and the male is a bit elongated and has a nipple to one side. The insect lies under the scale, and is yellow in colour. In the early stages the insect has three pairs of legs, two antennae, and sucking mouth part, and in the later stage the legs deteriorate and the insect becomes a mere reproductive machine. In the spring, when the temperature rises, the males, which are winged, hatch out and fertilize the females. The females produce nymphs which crawl about and can be seen by the trained eye. The nymphs are small, and yellow in colour. The nymph is very active and pushes its mouth parts into the bark and feeds on the sap of the host plant, and then makes a sort of waxy cover over itself. The progeny from one parent has been estimated at 1,608,040,240. It can be easily figured out just why this scale is one of the most serious pests of the world. This insect is found on ornamental, fruit, and forest trees.

The entomological staff is fighting this pest by spraying with lime sulphur and a stock solution prescribed by the Imperial Entomologist. If everyone who owns orchards will spend his time and energy to fight this pest, maybe it will be eradicated. We would not expect milk from a cow if we do not feed it. To keep an orchard is easy, but to look after it is the real problem.

[EDITOR'S NOTE—Mr. Vachoo is in charge of marketing farm crops at the Allahabad Agricultural Institute. He was lately employed by the Department of Agriculture, Kashmir, in fighting the San Jose Scale. San Jose Scale is present in Indian hill orchards].

THE MANUFACTURE OF INDIAN SWEETS

N.R.Joshi, I.D.D.

White Rasgulla, or Chamcham

Take 10lbs. of milk. This milk should not be too rich in fat. It could be standardized to 3 per cent fat. The milk should now be put on the fire and allowed to boil. As soon as it has reached the boiling stage, it can be taken off. Either add 4 to 8 ozs. of old whey, or take about 1 to 2 ozs. of clean alum powder and mix it with the milk. The addition of whey or alum facilitates in precipitating the milk solids. Allow this coagulum to settle. When the whey looks clear, and is still lukewarm, remove it through a muslin cloth. Tie the coagulum in the cloth and allow the remaining whey to trickle down, but do not apply any pressure.

Preparation of Syrup.—For the above quantity of milk take about 2 to 2½ lbs. of sugar. Add to this about ½lb. of water and put it on the fire. Then take in a clean vessel ½lb. of water and add to this 2 ozs. of milk. When the syrup begins to boil, add about ⅓rd of the mixture of water and milk. This will facilitate in bringing to the top the dirt from the sugar. Remove this dirt with a spoon. Repeat this process till all the dirt is removed. Then remove the syrup from the fire.

Kneading of Coagulum.—Take the coagulum from the cloth and spread it on a tray. Break all the lumps, and knead it thoroughly into a fine mash. Then weigh the coagulum and add to this about 1 oz. of wheat flour (maida) per pound of coagulum, and knead it thoroughly again. Then take about 1 oz. of this and roll it into a small ball. In the centre of the ball a small quantity of finely-cut pistachio nuts or almond pieces may be put.)

Then see if the syrup is ready; that is, it should be light, and not thick enough to give out any threads when you feel it with your index-finger and thumb. If it is thick, add a little water. Put the syrup on a slow fire. When the syrup begins boiling, put the coagulum ball into it. If the ball does not break, put the rest of the balls into the syrup; in case the ball breaks as soon as it is put into the syrup, add ½ oz. to 1 oz. of flour again to the coagulum, and knead and roll it into balls. Allow these balls to boil in the syrup, taking care that the syrup does not thicken, which can be prevented by adding a little water. The boiling process may be continued till all the balls begin to sink in the syrup. Then remove it from the fire and allow it to cool down. The rasgullas are then ready for use.

Halwa from Papaya Fruit

In our last issue we wrote a short note about the papaya fruit. Now we propose to give a receipe of an Indian preparation from papaya fruit:—

Take two full-sized ripe papayas. Remove the seeds and peel the fruit. Rub it for a short time, put it through a gauze sieve, and strain the juice. Mix 4 ozs. of *khoya* thoroughly in this juice. Take 2 tablespoonfulls of *ghee* in a frying-pan and put it on a slow fire. Put your papaya and *khoya* mixed in the pan and fry it till it gets slightly brownish. Then take 1 lb. of sugar and make some syrup. The consistency of the syrup should be such that, if you put a little on the thumb, press it with the forefinger, and then release it, it will give one string only. Then put your mixture of *papaya* juice and *khoya* in this syrup and place it on a slow fire. Stir it occasionally with a paddle so that it may not stick to the bottom and burn. When it is sufficiently thick, remove it from the fire, transfer it to a plate, and allow it to cool down. Cut into small cakes and serve it. It is a delicious dessert.

[EDITOR'S NOTE.—This is the second article of the series by Mr. Joshi on the Manufacture of Indian Sweets.]

CREAM SEPARATION

DAIRY DEPARTMENT, A.A.I., ALLAHABAD

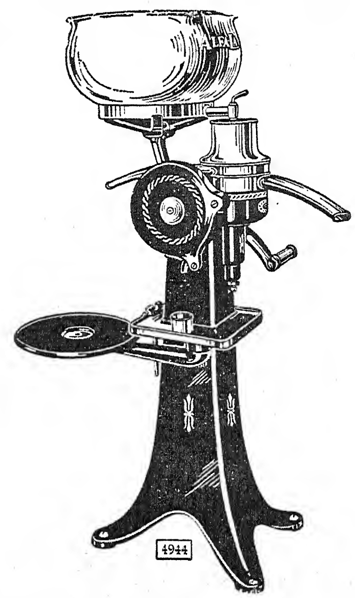
Cream is not a definite specific substance. It is a portion of milk in whch the milk-fat is concentrated. Cream may contain a variable amount of fat, the percentage ranging from 10 to 80 In commercial practice it is decidedly more economical to ship thick or "rich" cream than thin or "poor" cream. A notable case is that of the large co-operative organization—"The Land o'Lakes Creameries, Inc."—who ship sweet frozen cream testing 80 per cent fat from the mid-west to the New York market, that is, half-way across the American continent.

The thickness or thinness of the cream depends largely upon the manner of separation. For those who are not in a position to employ mechanical means of separation it may be profitable for us to discuss the older, though less efficient, methods of separation, as well as the mechanical method.

Whenever milk is allowed to stand, cream is bound to rise, provided that the milk has not been adulterated with too much water by the local gwalla. Cream rises because of the difference in specific gravity between the fat and the solids-not-fat and the

milk serum. This is called gravity creaming. From olden times it has been practised the world over by dairymen in the practice of the "shallow-pan" and later the "deep-pan," with some variations.

Where small quantities of milk are produced, these methods are still used. In the shallow-pan system the warm milk is placed in shallow containers not over 2 to 4 inches deep. The pans are placed in the coolest spot available, and the cream is skimmed off at the end of 24 to 36 hours. The objections to this system are that the skim-milk is usually sour and unfit for general use, and that a large percentage of the fat is lost in the skim-milk, the percentage being about 1·5 of fat, and about equal to a loss of 20 or more of the total fat.



Illustrati on of Cream Separator [Through the courtesy of Messrs. Edward Keventer, Ltd., Aligarh, U. P. Agents for Alfa-Laval Cream Separators]

In the "deep-pan" method cans about 20 inches deep and 8 to 15 inches in diameter are used. These deep pans can be placed in cool running water, cool well water, ice water, and the like. The low temperature of the cooling medium effects a comparatively rapid separation of the cream, giving a better quality of cream than is secured by the shallow-pan method, and the skim-milk is better for feeding purposes. In both of these methods the percentage of fat in the cream secured ranges around 20.

The water-dilution method is a variation of the deep-pan method. It consists of adding cold water to the milk before setting. This method is not advocated because the skim-milk is not palatable on account of the water added, and the water introduced may often contain undesirable micro-organisims.

In the systems briefly discussed the temperature of the milk and surroundings plays an important part. The milk should be set in a very cool place, or the milk should be cooled by setting in ice water.

The most efficient system of cream separation is known as *Centrifugal Creaming.* It is not our intention to go into the

history of the development, but merely to point out the important points in connection with this method.

In centrifugal separation, by use of the modern cream separators, the milk enters a rapidly-revolving bowl. In the case of the Alfa Laval Daisy Cream Separator, the bowl revolves at the rate of about 7,000 revolutions per minute when the crank is being turned at a speed of 45 revolutions per minute. The milk entering the bowl is guided to that part of the bowl where the centrifugal force is greatest, which is towards the periphery or walls of the bowl.

Centrifugal force causes the instant separation of the fat and solids-not-fat. Two exits provide for the removal of the skim-milk and the cream. Space does not permit of going into details regarding the further construction of the centrifugal separator Suffice it to say that centrifugal separation is the most efficient method of cream separation. The loss of fat in the skim-milk in the best makes of separators is about ·1 per cent. In an official test carried out by the Swedish Government Research Institute the new model Alfa Laval Hand Separators left 0·075 to 0·08 per cent of fat in the skim-milk. The cream is fresh and sweet, and the skim-milk of good quality for human consumption. Nowadays, separators of various capacities are to be secured on the market. The cream for butter-making should test in the neighbourhood of 30 to 40 per cent fat. This quality can be regulated by adjusting the cream screw on the bowl.

THE PHYSICAL PROPERTIES OF MILK

W. J. Hansen*

Milk under the Microscope. Without he use of a microphotograph it is difficult to picture just what the microscope presents when a slide of fresh milk is observed. Heineman has described such a microscopic field as follows: "When milk is freshly obtained from the udder, it is opaque, white in colour, with more or less of a yellowish tint, aad has a characteristic sweetish taste and odour. If a small amount of fresh milk is placed under the microscope, the field is almost filled with homogeneous disks of strongly refractive power and greatly varying diameter. They appear structureless, and without a membrane. Close observation of these disks shows that they frequently form clusters which consist of disks of varying size. In reality, the disks are spheres

*[See volume VI, No. 1 for "The Story of the Manufacture of Milk."
See volume VI, No. 2 for information on "The Composition of Milk."]

and consist of milk-fat. Besides these 'fat globules,' bacterial cells and particles of foreign matter may be seen." All of these substances are suspended in a fluid which is the serum part of milk.

The fat globules in milk are in the form of an emulsion. Milk has been called a natural biological emulsion. By this is meant that the fat or oil droplets are distributed throughout the fluid in small globules or subdivisions microscopic in size, and are held in suspension. We are familiar with the behaviour of an oil in water. Such a mixture is almost impossible to make. The oil immediately floats to and on the water surface because there is no other material to hold it suspended throughout the mass of water. If such a colloidal material is introduced into the mixture, it forms a protective film around the oil droplets and is known as a stabilizer, and the resulting mixture becomes an artificial emulsion.

These artificial emulsions can easily be made by mixing an oil with some substance like gum-tragacanth or gum-arabic and some water, and by agitating the mixture violently or by mixing it in a mortar. Such an emulsion is white and opaque, and in some respects resembles milk. The fat in milk is held in the natural emulsion by protein substances. Mayonnaise dressing is our most common example of an artificial emulsion. In its manufacture an oil fat, is emulsified (suspended) in water (vinegar) by the use of eggs as an emulsifying agent. Its processing is usually accomplished by the use of a homogenizer or viscolizer in a manner similar to the processing of an ice-cream mix.

When cow's milk is allowed to stand quietly for a short time, a layer of "cream" forms on the surface It has a pronounced yellow colour, and is usually well defined by a "cream line." This cream contains most of the milk-fat. Fat is much lighter than water. That we note in the floating of oil on water. In milk too there is a marked difference in weight, or specific gravity, of the fat globules and the skim-milk of milk serum. The action of the "earth's pull," or the law of gravity is great enough to cause a separation of the fat and skim-milk. If these layers caused by gravity separation are examined under the microscope, marked differences will be noted. In the upper portion, for instance, one will find the largest fat globules packed closely together. A few bacteria and cells will also be seen. In the middle layer one will see smaller medium-sized fat globules which are fewer in number than in the first layer. In the lower portion very few minute fat globules would be found, but large numbers of bacteria, cells, corpuscles, and dirt would be found. The "cream line" is one of the housewife's indices by which she judges quality in a bottle of milk.

Colour of Milk.—In the making of cheese whey is the by-product, and with the removal of the casein as cheese-curd we note

a greenish colour in the whey. This green of whey has been called the true milk colour. To the average person, however, the little casein particles which, like the fat, are floating about in the milk impart a whitish colour. The yellow fat colour gives us the variations from bluish-white milk to a golden-yellow milk. The yellow colour of the fat is due to carotin, so called because it is the colouring matter of the carrot. It is found in green plants, and is not manufactured by the animal. It is passed through the animal system and is secreted into the milk. Some cows, and particularly certain breeds, seem to be able to produce a milk of higher yellow fat colour than others. In this respect the Guernsey ranks first, with the Jersey, Shorthorn, Ayrshire, and Holstein in a downward gradation of colour.

Flavour and Odour of Milk.—Milk has a sweet flavour due to the sugar content. There is only a faint odour in clean, fresh milk. In most milk there is a peculiar taste and odour when the product is warm. They quickly disappear upon exposure to the air. These so-called "cowey odours and flavours" are too often due to carelessness or lack of cleanliness in the milking process. Milk is very susceptible to absorption of flavours, particularly undesirable ones derived from feed. Wild onions or garlic are particularly troublesome in this respect when cows are turned on to early spring pasture.

There seems to be no reliable or practicable milk plant process for treating onion-flavoured milk. It is essential that the food of the cow be regulated to prevent these absorbed flavours. Such volatile substances will be carried off by the intestinal tract of the animal, and not appear in the milk if milking is done several hours after odoriferous food has been eaten. A commou practice relative to wild onion in pastures is to turn out young stock for a week or two before the milking herd. Then too, if pastures are badly infested with onions, the cows are brought into the barns three or four hours before milking.

Many bad flavours are absorbed by milk if it is allowed to remain in the stable for any length of time. Milk should be cooled as soon as drawn. Many coolers are so constructed that the milk is aerated as it cools. Immediate removal from exposure to the stable air, quick cooling, and incidental aeration aid in preventing many of the common undesirable odours and flavours of milk.

Desirable flavours are also imparted to milk by the use of good feed. Lucerne, the common grain feeds, and good pasture grass are known to improve the flavour of milk and the products made from it.

Viscosity and Cohesion of Milk.—Milk is more viscous

than water. It has more "body." It takes longer for a drop of milk to run down a piece of glass than it requires for a drop of water. In other words, viscosity is a characteristic or property which sets up in a liquid a resistance to flow or change of position. Milk has a marked property of cohesion or stickiness. It sticks to the sides of a glass container more closely than water. These two properties of milk are important commercially. Cold milk has greater viscosity and cohesion than warm milk; therefore cold milk sticks to a container such as a vat or bottle more closely and in larger quantity than warm milk. Cold cream holds air better in its foam structure, and is easier to whip than warm cream. Heating reduces the viscosity almost entirely at high temperatures. Pasteurized milk is not as viscous as raw milk, but is more so than boiled milk. Too much viscosity in thick, cold cream interferes with butter-making. Ice-cream manufacturers have felt that increased viscosity in a mix was desirable. There seems to be two kinds of viscosity—apparent and basic. The former is not stable, and is readily destroyed by agitation. It is undoubtedly this type of viscosity to which the average person refers in speaking of milk, cream, or ice-cream mix.

Adhesive Properties.—The adhesive property of milk is pronounced, and has come to have considerable commercial importance Sweet milk sticks to wood, glass, and metals to a greater extent than does water. A paper moistened with milk makes a label that will readily stick to any dry object. Whitewash made by mixing slaked lime with skim-milk will remain on objects much longer than that made by mixing with water. The use of milk powder as a spreader and fixer for dusting powders in insecticide work makes use of this property of adhesiveness possessed by milk. The protein or curd content of milk is undoubtedly the material which contributes much to this property. Casein glue, for instance, is a most valuable product, and is used particularly in airplane con struction.

Freezing-point and Specific Heat.—The sugar and mineral salts in milk lower the freezing-point about 1° F. below that of water. In other words, milk freezes at a temperature of 31° F. For the same reason, it boils at a temperature slightly above 212° F.

The specific heat of milk is less than that of water; that is, it requires less heat to warm a definite amount of milk to a certain temperature than it does to heat the same quantity of water to the same temperature. Since milk is a poorer conductor for heat than water, it takes a longer time to reach a certain temperature. The specific heat of cream is lower than that of milk. The following are accepted specific heats for dairy products:—

Average Specific Heats—

Water	...	1·000
Milk	...	·945
20% Cream	...	·900
40% Cream	...	·870
Ice-cream Mix	...	·850
Ice	...	·500

Specific Gravity.—By specific gravity of milk we mean the weight of the milk as compared to that of an equal volume of water at the same temperature. If a certain vat of water weighs 1,000 pounds, an equal volume of milk under the same conditions will weigh about 1,032 pounds. Reducing the figure to a basis of 1, as is always done, the comparison between the two equal volumes of water and milk will be 1 and 1·032. This latter figure represents the average specific gravity of normal milk. The instrument used for the determination of specific gravity of liquids is called a hydrometer. The specific gravity of water is 1, and is the standard by which all specific gravities are measured. A special hydrometer bearing that portion of the scale relating to milk is used in dairy work. It is known as a lactometer.

It can be readily understood that comparative readings can only be given for specific gravity at the same temperature. The temperature at which lactometers are usually standardized is 60° F. The reason for this necessary standard temperature is because of the variation in density which occurs with variations in temperatures. We are all familiar with the effect of raising the temperature of a substance. The material expands at high temperatures. Likewise a glass of milk level full at 40° F. would overflow if heated to 100° F. As a substance or liquid expands, it becomes lighter in density, and its specific gravity therefore becomes less. The reverse holds true when a liquid such as milk is cooled. It contracts and becomes heavier in density.

The specific gravity of milk will also vary with its composition. A sample rich in milk solids-not-fat will give a high specific gravity reading. Skim-milk, for example, is high in specific gravity, and reads between 1·033 and 1·037. Milk-fat, on the other hand, like all fats, is light in density. Therefore a milk rich in fat or a cream high in fat will show a low specific gravity reading—

Average Specific Gravities—

Whole-milk	1·028-1·034
Skim-milk	1·033-1·037
Milk-fat	·930- ·950
Water	1·000-1·000
Sulphuric Acid	1·820-1·830

It is apparent that the addition of water to milk will lower the specific gravity. Due to this fact, it was early thought that milk adulteration could be detected by the use of the lactometer or specific gravity readings. This did not work successfully because it is further evident that the removal of fat will tend to raise the lactometer reading. As a result, it was found that cream could be removed from milk and water added in such a proportion as not to alter the density at all. Such manipulation of the milk, however, would lower the fat test so that, by using the lactometer and by determining the fat test of the milk, such adulteration could be detected. To-day, in commercial practice, fat and lactometer tests are run together.

HORTICULTURAL NOTES

By A.D.Chand

The existence of the small and irregularly-planted orchards in many Indian villages is the striking feature of fruit gardening in the olden days. Much emphasis has been laid upon the improvement of the staple crops, though scientific fruit culture has been entirely left to a few botanists and horticulturists.

There is no question, however, that horticulturists have paid a good deal of attention, during the last few years, to the introduction of modern methods of propagation, plant-breeding, and cultivation. India is certainly indebted to them for the pains they have taken to improve the varieties of fruits and the looks of gardens. A good many people, realizing the value of fruit culture, have taken to scientific fruit gardening. Even though scientific fruit gardening in India is still in its infancy, the production of fruits and vegetables in certain periods of the year and in certain provinces is far higher than the consumption, and it hardly pays the grower to pick and cart them to the market; at other times of the year it is very difficult to get any fruits and vegetables for one's own consumption, even at a very exorbitant price. So, if a farmer can take a little more pain and convert his excess produce into preserves, not only could he use them during the period when fresh fruits and vegetables are scarce in the market, but also he could sell his preserves at a better price than he could have got if he had glutted the market with them. The principles and modern methods involved in fruit products are discussed in this article.

Jelly-making.—The manufacture of jelly and other fruit products is one of the oldest fruit product industries in the West, which was previously lacking in India, but it now seems to be spreading very rapidly here as well. It affords a means of utilizing a

large amount of sound, culled fruits unsuited to other purposes.

Constituents of Jelly.—The essential constituents of jelly are pectin, acid, sugar, and water. Of these, pectin is the most important. The fruits for jelly should contain sufficient pectin and acid. Some fruits contain enough of both pectin and acid for the purpose; some are deficient in one or the other of these constituents, and others in both acid and pectin. General information may, however, be gathered from the following classification for guidance: lemons, crab-apples, acid varieties of apples; sour varieties of blackberries, grapes, oranges, plums, cherries, and guavas; limes and roselle are rich in pectin and acid; sweet varieties of cherries, unripe figs, pie melons, carrots, and unripe bananas are rich in pectin and low in acid; apricots and most varieties of strawberries are rich in acid and low in pectin; ripe vinifera varieties of grapes, ripe blackberries, ripe apples, and loquats contain a moderate amount of both pectin and acid.

Pectin Test.—A teaspoonful of the juice and a teaspoonful of 95 per cent rectified spirit are mixed in a tumbler. A juice rich in pectin forms a jelly-like mass; one of medium pectin content forms several large lumps of jelly-like material; and one poor in pectin forms a few small pieces of stringy precipitation, or no precipitation whatsoever.

If a certain fruit is deficient in pectin or acid, it may either be added artificially, or blended with the fruits rich in the required constituent.

Process of Jelly-making.—The fruit is properly washed and boiled for some time to obtain the maximum yield of juice and pectin, for boiling converts the pectose into pectin, which is mostly found in many fruits, mainly in the skin and seeds. Enough water is added to avoid burning, and to obtain a good yield of juice. It is then drained through a cloth bag. The amount of sugar to be added directly depends upon the sugar and pectin content of the fruit. However, two parts of sugar may ordinarily be added to three parts of juice. It must be well remembered that too much sugar may either result in soft jelly or in absolute failure, while too little gives a small yield of stiff jelly. After adding the sugar the juice is boiled rapidly until the desirable consistency is acquired. The end point, which is a bit difficult to determine, and which requires some skill in practice, is tested by allowing the juice to drip from the large spoon. If it congeals and breaks in sheets or hangs in large drops, the jelly is supposed to be ready, and may be poured in the desirable containers and sealed if it is to be kept for a long time.

Preparation of Jam.—Jam is very easily prepared from most fruits and tomatoes. The fruits should be fully matured in order

to produce a better flavour and texture, while uuripe and spoiled fruits should invariably be avoided because they produce a very poor quality of jam, which is liable to ferment in no time. The fruits should be washed; in some cases, peeled and pitted. Peaches, pears, apples, and such other fruits are peeled, while apricots, plums, and other thin-skinned fruits require no peeling. Firm fruits should be boiled in a small quantity of water; berries should only be washed and crushed.

Normally an equal amount of sugar is added to the pulp because the excess of sugar keeps the jam from fermenting. In very rare cases, a smaller amount of sugar is used. Cooking is continued until the desired consistency is reached. The jam is then poured in jars or other containers. It keeps well if sealed afterwards.

[EDITOR'S NOTE:—These notes will be continued in the October issue.]

ACTIVITIES OF THE ALLAHABAD AGRICULTURAL ASSOCIATION

The Allahabad Agricultural Association was formed in the year 1927 for the development of agriculture in the Allahabad District. Since then, it has held agricultural exhibitions, with the help of the Agricultural Department and the Municipal and District Boards of Allahabad, every year at the Magh Mela at Allahabad, where a vast concourse of pilgrims, representing every province and drawn from every stratum of society in India, assembles in lakhs to have a dip in the holy Ganges.

Besides these annual exhibitions the association held 79 travelling exhibitions and demonstrations in the following important places of the district on market days for the development of agriculture, etc.:—

1st Batch of Exhibitions held from 25th June, to 9th August, 1929

1. Soraon.
2. Anapur.
3. Handia.
4. Sarai Mumrez.
5. Maudaha.
6. Daiyya.
7. Meja Khas.
8. Sirsa.
9. Karchana.
10. Karma.
11. Karma (Vicinity).
12. Jasra.
13. Iradatganj.
14. Naini.
15. Begum Sarai.
16. Manuri.
17. Chail Khas.
18. Sarai Akil.

19. Ajhuwa and Kara Daranagar.
20. Pachchim Sarira.
21. Karari.
22. Sarsanwan.
23. Manjhanpur and Bharwari.
24. Bamhrauli.
25. Sirathu.

2ND BATCH OF EXHIBITIONS HELD FROM 1ST OCTOBER, TO 12TH DECEMBER, 1930

1. Phaphamau and Malaka.
2. Kaurihar (Nawabganj).
3. Sarai Bharat.
4. Mahraunda.
5. Mau Aima.
6. Soraon.
7. Pandla.
8. Ismail Khas.
9. Sarai Mumrez.
10. Handia.
11. Saidabad.
12. Hanumanganj.
13. Sabson.
14. Jhusi.
15. Allahabad (Headquarters).
16. Lawain (Kalan).
17. Karchana.
18. Baron.
19. Shankargarh.
20. Sunderpur.
21. Garhaiya.
22. Karma.
23. Khiri (Mawaiya).
24. Ramnagar.
25. Sirsa.
26. Mahoba (Kalan).
2.. Bharatganj.
28. Koraon.
29. Meja.
30. Allahabad (Headquarters)
31. Salahpur.
32. Bamhrauli.
33. Manauri.
34. Bahagaon.
35. Bharwari.
36. Shahzadpur.
37. Sirathu.
38. Kara.
39. Manjhanpur.
40. Karari.
41. Sarai Akil.
42. Chail Khas.
43. Allahabad (Headquartrs)

3RD BATCH OF EXHIBITIONS HELD FROM 1ST TO 26TH JULY, 1930

1. Phaphamau.
2. Nawabganj.
3. Sarai Bhagat.
4. Mahraunda.
5. Mirzapur (Bhagipur).
6. Mau Aima.
7. Soraon.
8. Tikri Pindra.
9. Mohanganj.
10. Singraur.
11. Savaith.

In the above travelling exhibitions and demonstrations the following departments were good enough to co-operate (The Allahabad Agricultural Association is highly obliged to these departments for the help received from them):—

1. Agricultural.
2. Veterinary.
3. Co-operative.
4. Public Health.
5. District Board.
6. Collector of Allahabad.
7. Chilean Nitrate Committee
8. Allahabad Agricultural Institute.
9. Local Zamindars.

These shows were welcomed at different places as was evident from the gathering that attended these exhibitions, etc., at each place. People showed their eagerness to get the exhibitions continued for a year or so with a view to get sufficient chance to acquaint themselves with the new ideas and ways of improvement so that they may adopt them. On account of the above activities the demand for genuine seeds of various kinds has so much increased that the department of agriculture finds it rather difficult to comply with them with the present local staff at its disposal. A brief report of these exhibitions was sent to H.E. the Governor of the U.P. for his information, as desired by him.

II. The Allahabad Agricultural Association sent a proposal to the Chairman, District Board, Allahabad, for the conversion of all the compounds of the District Board schools into demonstration farms. This proposal has been accepted by the Chairman of the District Board, and necessary steps are being taken by the board in the matter. These school compounds will be used for demonstration purposes in the agricultural travelling exhibitions wherever possible.

III. The association also approached the rich zamindars of the district in order to persuade them to open agricultural farms in their respective zamindaris. Farms have already been opened, and other zamindars are also contemplating opening more farms.

The agricultural farm at Sunderpur of Lal Vishundeo Singh was visited by me along with the Deputy Director of Agriculture on the 22nd February, 1930. Lal Vishundeo Singh is doing splendid work on his farm, and he specially deserves every encouragement from the agricultural department.

IV. The association also approached the Minister for Education, U.P., for opening a teachers' training class for 72 school teachers of the local Hindu Sabha Hindi Sanskrit pathshalas, aided by the District Board, for giving the teachers elementary training for

one month in the following subjects in the month of June:—

1. Agriculture.
2. Co-operation.
3. Veterinary hygiene.
4. Cattle-breeding.
5. Manures.
6. Sanitation and hygiene.
7. Social Service.
8. First-aid.
9. Practical demonstration in agriculture and physical culture, from the 1st t the 3rd July, 1930.

The proposal was approved by the Minister, who kindly sanctioned a grant of Rs. 1,000 for the above class. *The training class was held at the Agricultural Institute, Naini*, where arrangements were made to give practical training. Three lectures were delivered in each subject. Those teachers who received elementary training are required to help the various departments named above, working in the district for the development of agriculture, etc., and will help the co-operative department in farming, better-living societies, etc., in the villages without any recurring charge to the departments concerned. It will thus be seen that much can be done for the development of agriculture very economically indeed, and in a very short time. If this experiment proves successful in this district, it can be tried in the other districts of the provinces.

The Minister for Education, U.P., was good enough to visit the training class, and was very much satisfied with it.

V. The Allahabad Agricultural Association is also trying to increase sugarcane cultivation in this district.

VI. A report of the Agricultural and Industrial Exhibition held at the last Kumbh Mela at Allahabad has been published separately.

VII. The Allahabad Agricultural Association has been registered under Act XXI of 1860.

VIII. The Allahabad Agricultural Association is contemplating undertaking the work of supplying seed in this district shortly. The association regrets that for want of funds it cannot as yet do as much as it is anxious to do for the development of agriculture in this district.

IX. The Allahabad Agricultural Association is specially obliged to Lal Harbhajan Lal, Deputy Director of Agriculture, Bundelkhand Circle, Allababad, and his assistants for the keen interest taken by them in helping the association in the development of agriculture in this district.

The association believes that, if the co-operation of all the abovenamed departments kindly continues as before, the associa- will be able to carry out its aims and objects for the rural uplift in this district before long.

MOOLCHAND MALVIYA,
Honorary Secretary,
Allahabad Agricultural Association,

THE
Allahabad Farmer

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"The greatest mechanical economic loss from which India suffers is the loss of fertile soil by erosion."
Dr. SAM HIGGINBOTTOM

APRIL
1932

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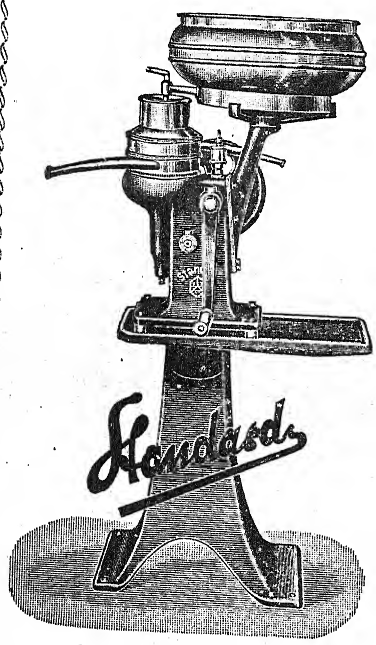

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EDITORIAL NOTES NEWS, ABSTRACTS

A World Record Goat.

A world's record was made during the year by the Saanen doe, Echo of Deerfield, owned by Miss J. E. Harvey, Cordora Bay.

At first freshening the goat gave 4,240·6 lbs. in 365 days, an average of 4½ quarts per day, with a butter-fat test of 4·65 per cent fat.

*　　*　　*　　*

War in Canada.

"The war in China, such as it is, is being waged more than five thousand miles from the nearest Canadian point. It is being fought too on Canadian soil, not with bombs and guns, as at Shanghai, but with that well-known Oriental device—the boycott. Chinese merchants refuse to handle products produced by Japanese labour in Canada. So long as the Chinese restricted this peculiar form of warfare to Japanese goods in China, no one except the Japanese had much interest in the matter; but, when Chinese merchants in B.C. discriminate against Canadian-grown fruits and vegetables because of Japanese labour employed in their production, the matter takes on a different light. Then the 'war' reaches Canadian territory. Cases in point are early vegetables produced by the Japanese for the coast or prairie trade, soft fruits, and potatoes. Also dry salt herring, of which B.C. produces in the neighbourhood of forty thousand tons per year. What to do about it appears to be nobody's business, least of all the business of white producers of products affected. But the 'rights' of the matter are open to question."—*The Nor' West Farmer, Winnipeg, Canada.*

*　　*　　*　　*

Napier Grass.

We are pleased to say that there has been considerable interest shown by our readers in Napier grass during the last year. We have supplied a large number of farms with roots. We would like to hear how the grass is doing in other parts of these provinces and elsewhere.

Septic Tanks.

That folks are becoming "sanitary-minded" is evidenced by the great demand for plans for septic tanks. Blue prints, with complete instructions, are still available at Re. 1. from this office.

* * * *

The Etah Poultry Show.

The fifteenth annual Etah Poultry Show has just been concluded, and marks the high point in poultry-raising in the Etah District. There are two outstanding features about the show: (1) that it is a villagers' show; and (2) that pure-bred fowls of the White Leghorn and Black Minorca breeds make up 95 per cent of the show.

A total of 2,341 exhibits by 329 exhibitors from 174 villages was represented. These village-men spread out over 8 districts.

At no classic show in either England or America are such large classes in Minorcas and White Legnorns to be found as have characterized the Etah Show.

The show is the consummation of careful work in the district by Mr.A.F.Slator carried over the period of the last twenty years, and the excellent co-operation and support of the local Government, the District and Municipal Board of Etah, the Municipal Board of Kasganj, the Collector and District Magistrate, the U.P.P.A., the Civil Veterinary Department, and many friends, official, non-official, and missionary.

The slogan in the villages is now, "More milk and eggs for the children"—two requisites much needed for the raising of strong children. In connection with the poultry show, an agricultural and veterinary section were also of great interest. It is proposed to open a goat section next year, and thus help to more greatly popularize the slogan "More milk and eggs."

An outstanding feature of the Etah Show was the visit of His Excellency the Governor—Sir Malcolm Hailey. In a brief speech, before the distribution of prizes, His Excellency voiced his appreciation of the show, and the splendid efforts being made through poultry-raising to improve the economic status of the villager, and particularly the low-caste people.

Mr. Pande, of the U.P.Poultry Association, in making the judges' remarks, drew attention to the need for developing the poultry industry in each and every district of the provinces, and finding suitable markets for surplus poultry produce.

Tourists to Kashmir

To those of our valued readers who contemplate a holiday in Kashmir we cannot do better than recommend a visit to Ganemede. We were delighted with the very fine display of wood-carving, painted papier, mâchè, and curiosities. We can recommend the firm for generous hospitality and square dealing. Its advertisement may be found in our advertising pages.

* * * *

Goat-Breeding.

Recently, at Etah, we saw the beginning of the work in goat-breeding being supported by the Imperial Council of Agricultural Research. The work is very commendable.

The bucks we saw at Etah are quite a contrast to the breeding bucks ordinarily seen in the villages. A great deal of improvement of the local breeds can be done by interested persons in simply maintaining fine specimens of males for breeding and use by villagers. It is a good line for public-spirited men everywhere to take.

* * * *

Kitchen Gardens.

Nearly every bungalow makes some attempt at a flower or vegetable garden. Very few gardens of any description are to be seen around *servants' quarters.* We trust our readers will give this matter some thought.

In recent years the Bengal Department of Agriculture has done a great deal towards developing vegetable gardens by the distribution of 1 anna packets of vegetable seeds.

Those who are interested in flower, fruit, or vegetable gardening can secure help and suggestions by writing the Superintendent, Government Gardens, at any of the large cities, or by addressing *The Allahabad Farmer.*

* * * *

Papaya Fruit.

Just now we are enjoying the fruit of the papaya tree. It is really delicious in flavour, and supplies the need of "an apple a day." The trees produce a prolific amount of fruit. Seeds can be had for the asking and return postage. We strongly advise our readers to go in for this fruit around their bungalows.

Napier Grass Cuttings.

The early part of the rains is the best time to put in Napier grass cuttings. With abundant irrigation tremendous yields are secured. During eight months at the Agricultural Institute, in 1931, we secured 2,400 maunds to the acre. Cuttings can be secured for planting out; about 16 maunds of roots to the acre are required. Prices are Rs. 5 per maund. In the rains Rs. 3 per maund f.o.r. Allahabad. Send in your orders now to the AGRONOMY DEPARTMENT.

* * * *

Determining the Amount of Adulteration in Milk.

It will be of interest to our readers to know that adulteration of milk can now be determined as closely as 3 per cent. The method used in America is known as the "Hortuet Cryoscope" using ether as one of the refrigerating mediums. Work on this method has been going on at the Dairy Research Institute, Reading, England, and the method has been simplified.

It is encouraging to know that a method is now within the reach of Municipal Boards so that they can check up on the milk sold within their limits. It is surprising how many people place their faith in a lactometer that is *supposed* to give directly the amount of added water. We only wish the matter was so simple.

The chief difficulty in India does not lie along the technical side, but along the direction of human nature. The big question is whether sufficiently honest and reliable men can be secured to carry out tests, and maintain standards, or whether an "Adulteration Act" and other regulations would simply be made a means for dishonest personal gain. This is a prevailing attitude. So many people have said that "milk ordinances, adulteration acts, and other regulations" would not improve the present standard of milk production and sale in the cities because of the fundamentally dishonest nature of the men engaging in the dairy business. If this is true, then it is also true that what the dairy industry needs is good strong legislation and a body of men that can be relied upon to carry out its duties.

* * * *

A Visit to Bara Bazar, Calcutta.

We are sure that, if milk consumers in India could only see the filthy, dirty, and unsanitary way in which milk is handled in the Bara Bazar, they would never drink another drop of milk during their lifetime and would get nauseated at the mention of the word milk.

The last time I visited the bazar what did I see? Milk is brought in from the outlying districts, mostly in lotas and pails

carried on the head. In most cases a handful of straw covered the top of the lota or pail and helped to prevent the milk from spilling out. At the bazar the straw is taken out of the lota by a dirty hand, thrown on the floor, usually on top of some *pan* juice. The prospective buyer and hawker sits squatting and inserts his hand into the milk to test the quality. Some of them use the finger-nail test or dash milk upon their forearm and rub the milk to see if it contains any fat. If the milk is of poor quality, or the price cannot be agreed upon, then the straw, dirtier than ever, is thrown back into the lota, and another purchaser is sought.

It is surprising in a city the size of Calcutta that such practices are still allowed to persist!

* * * *

Nutrition and Disease.

Knowledge of animal nutrition has increased very rapidly during the last twenty years. Nutrition has such an important and direct bearing on the prevention or cure of disease that it may now be regarded as a new branch of medical science.

The present century has recognized that a diet may be adequate in calories and protein, and still deficient in some inorganic constituents. Modern studies on the adequacy or inadequacy of a diet are now judged by observations on the state of health, the presence or absence of symptoms of disease, the rate of growth and powers of reproduction, thereby bridging the gaps that formerly existed between purely biochemical and physiological studies.

It is now recognized that certain deficiency diseases may arise from a lack of specific nutriments, whether vitamins or minerals. Deficient diets may also lower resistance to disease and make a person decidedly susceptible to certain infectious diseases. A classical example is the development of xerophthalmia in rats, due to a deficiency of vitamin A, and a high proportion of deaths from respiratory and alimentary infections are also attributed to a lack of vitamins in the diet.

Recent work in South Africa on cattle seems to indicate that a deficiency of phosphorus increases the death-rate. It is also said organisms, normally present in the body in a non-pathogenic state, when in an animal on a perfect diet, can give rise to specific signs of infection when the animal is on an abnormal or deficient diet.

The influence of nutrition on susceptibility to disease is a subject that is only beginning to be explored. Orr, of the Rowett Research Insititute, Aberdeen, outlines three important lines of work that are being attempted: (1) the changes which occur in the composition of the blood under different dietary conditions;

(2) the effect of diet on immunological reactions; and (3) the effect of diet in altering either the nature of the flora or the pathenogenicity of the existing flora in the respiratory, intestinal, and other areas in the body. The level of the mineral elements in the blood, the influence of diet on the alkali reserve of the blood, and the correlation between composition of diet and composition of blood are some of the striking studies being made by the Rowett Research Institute.

The pH of the blood can be altered by the food, and the studies indicate that the alkali reserve of the blood is an important factor in resistance to infection, and that changes in the pH level of the blood affect differently different types of bacteria. There is no doubt that many diseases can be treated from a purely nutritive point of view.

The results are meagre, and experimental work needs to be confirmed; only the fringe of possibilities has been touched. *What is needed is more knowledge of how to prevent and cure disease*, and in this respect the scope of nutrition cannot be overestimated.

What is chronic ill-health? Is it not largely the lack of proper adjustment of the physiological processes? Surveys indicate that malnutrition exists to probably a greater extent than is popularly supposed. It is said (U.S.A.Public Health Report, 1918) that 19·0 per cent of the schoolchildren in the U.S.A. are undernourished. Studies in England indicate varying rates of mortality between different classes, of people, and show a possible relation between social rank or profession and diet. From a survey of 607 families in the seven largest Scottish towns it was found that the protein intake was insufficient for the optimum requirements for growth in children in 41 per cent of the families.

Sufficient has been said to indicate the relation and importance of an adequate diet in the maintenance, prevention, and cure of disease. It is up to each individual to pay close attention to this important subject and take full advantage of the knowledge of this new branch of medical science.

* * * *

Iodine and Iron in Animal Nutrition.

Elements like calcium, phosphorus, sodium, potassium, and chlorine occur in relatively large amounts in food-stuffs, in animal organs and tissues. Iodine, iron, copper, manganese, and aluminium are present in only minute quantities.

These elements exert an effect on the normal metabolism of the animal. Just what effect do each of these elements produce?

As yet it is difficult to give exact figures for the content of these elements in various food-stuffs, although evidence is accumu-

lating from various countries. Godden, of the Rowett Research Institute, Aberdeen, has very well reviewed the existing state of knowledge, and his conclusions are incorporated in this abstract.

A rough classification of food-stuffs, according to the amount of iodine, is as follows:—

		Vs per 100 grms. of dry matter
1.	Sea-weed	5870-536·000
2.	Watercress	19-44·8
3.	Grass	15·3-500·0
4.	Vegetables (lettuce, cabbage)	16·0-154·5
5.	Hay	5·6-40·0
6.	Potatoes	4·5-14·0
7.	Peas	6·4
8.	Roots (swedes, turnips, mangolds)	3·1-87·0
9.	Beans	2·1-3·0
10.	Carrots	0·2-77·5
11.	Cereals (wheat, oats, Rye)	0·1-17·5

V = ·000001 grm.

Much of the work on iodine has been done in connection with treatments for goitre in both animals and humans. With sheep, it was found that daily rations containing 51·8 mg. gave the best results, and that higher doses were not tolerated. Stiner found that feeding iodized salt to cows gave an increase of 8 per cent in the milk yield. The animals receiving potassium iodide had much sleeker coats than those in the control group. With poultry also, feeding of iodine has resulted in a bigger number of eggs, a heavier egg, or both. There is also some evidence that iodine increases the resistance of the animal to disease. It is also said that feeding an iodized salt mixture is a beneficial treatment for abortion and sterility in cattle.

The occurrence and quantity of iron in various food-stuffs has not been definitely worked out. Godden gives the following table from various sources:—

		Iron content as mg./100 grm. of fresh matter
1.	Bloodmeal	94·
2.	Meat and bone meal	53·
3.	Fishmeal	42·
4.	Oil-cakes and meals	22-63
5.	Dried yeast	20·5
6.	Dried grains	18·0
7.	Milling offals	12·6-15·7
8.	Grass and hay (variable)	10-30 on a dry matter basis
9.	Egg yolk	7·60
10.	Cereal grains	2·8-6·1
11.	Eggs	2·52
12.	Legumes (peas)	1·5
13.	Potatoes (unpeeled)	0·87
14.	Turnips	0·72

It is definitely known that iron plays a part in the function of the nucleus and the cell generally, but just what part it plays in the metabolism of the cell is not yet understood. Iron is essential in the formation of hæmoglobin. There are several views as to the way in which iron may be taken to function in blood regeneration: (1) in some organically combined form such as in egg yolk; (2) in ionized form such as in iodized salt; or (3) in inorganic form in combination with traces of other elements such as copper and manganese. It is quite possible that copper may act as a catalyst.

There is a need for large-scale feeding trials continued over long periods before any definite conclusions and advice can be given with regard to supplementing a given ration with small doses of these elements.

* * * *

The Mineral Requirements of Dairy Cattle.

Crichton, of the Rowett Research Institute, Aberdeen, gives a comprehensive review of the marginally-noted important subject, covering 124 references and experimental work at the Rowett Institute. The same was printed in the *Journal of Dairy Research*, Volume II, No. 1.

Evidence suggests that a deficiency of phosphorus limits the milk yield; but, under ordinary conditions, where concentrates are fed, phosphorus is not likely to be a limiting factor. In the same way, calcium may be a limiting factor. The lack of salt in the diet has been shown to result in a complete break-down, shown by loss of appetite, rough coat, lustreless eyes, and a rapid decline in both live weight and yield of milk, chlorine, and not sodium, being the limiting factor. Iodine, even in doses up to 100 mg. daily, has not resulted in increases in the milk yield, at least for the first lactation. Iodine doeshave a beneficial effect on the general condition of the animal.

Reproduction is greatly influenced by the mineral content of the feeds. Rations containing an ample supply of minerals definitely improves the reproductive capacity of the animal.

Good pasture supplies both calcium and phosphorus in the proper proportions. Concentrates are usually deficient in calcium, although relatively rich in phosphorus.

The mineral differences in rations of cows may be made good by the addition of mineral salts.

* * * *

Grading Up is the Sequel of Milk Recording.

Garner, of the University Farm, Cambridge, summarizes the advantages of milk recording as follows:—

1. The milk yield of each individual cow can be ascertained and authenticated.

2. The poor producing cows can be culled—such culled cows are frequently those that have milked well and filled the pail shortly

after calving, but who lacked persistency and went dry a few months after calving. Such cows, in the absence of milk recording, would, in all probability, have been missed.

3. It provides the only sensible, economic way of feeding concentrates, namely, according to production. By this means the higher producers receive more concentrates; thus their milk yields can be maintained without undue strain upon themselves, and thus they have a greater chance of having a longer life in the herd.

4. Daily recording gives the farmer a barometer of the cow's health for any sickness is quickly reflected by a fall in the milk yield.

5. The mere fact of being able to sell cows with a milk record will increase their capital value for they have proven their powers of milk production—they are known to be potential producers for future lactations.

6. Similarly, the heifer calves sold from the recorded cows will have an increased value because they will naturally be expected to milk reasonably well.

7. The farmer is provided with the necessary data from his cows to enable him to formulate a breeding policy. This must involve a rearing policy too, which, despite the present high cost of calf-rearing, provides the only way to herd improvement.

8. Also the breeding value of the bull can be ascertained by comparing the milk yields of his daughters with their dams.

9. The marking of the calves shortly after birth by the Milk Recording Society's representative assists the farmer in his breeding policy.

10. The Milk Recording Society advises farmers on the rationing of their cows, and provides the farmer with a convenient book for the keeping of his records.

11. It creates interest, and encourages the cow-men to do their best.

* * * *

Dental Decay May Depend on Physical Quality of Diet.

Score one for the tooth-brush and tooth-paste manufacturers. The latest theory about what makes teeth decay upsets the explanation of food experts, and goes back to the idea that teeth decay when food stays in them and decomposes, it appears from a report in the magazine *Science*, by C.A.Hoopert, P.A.Webber, and T.L. Canniff, of Michigan State College.

What you eat probably affects the condition of your teeth, but it is the physical quality and consistency of food, rather than its chemical composition, that counts, these investigators think.

"The elimination from the diet of foods that are difficult to remove from the teeth would perhaps go far in wiping out dental worries," these investigators stated.

The foods that have plenty of vitamins and calcium, the so-called protective foods, also happen to be foods that do not stay in the teeth long. Milk, for instance, and other dairy products may owe their tooth-strengthening properties as much to the fact that they don't stick in the teeth as to their lime and vitamins.

The fact that improvement in the condition of the teeth follows a change in diet to include more of these foods may be simply because the increased amount of "protective" foods necessarily reduces the consumption of the foods that tend to remain in the teeth and decompose and cause decay.

The Michigan investigators base their theory on observations on rats. In the first place, these animals do not often develop caries, even when fed on diets lacking in factors supposedly essential for tooth development. But normal animals fed on the stock laboratory ration, designed to promote normal dental development and maintenance, were found with decaying teeth.

Further investigation showed that particles of the cornmeal, which formed a large part of the diet, lodged in the lower molar teeth. In a few weeks a small cavity appeared where the impaction of cornmeal had been. This encouraged more impaction of the cornmeal particles, and more decay.

On the other hand, rats that were being fed a diet low in calcium and vitamins, but with oatmeal substituted for the cornmeal, had no decayed teeth, even though the teeth were relatively soft in structure. When oatmeal was substituted for cornmeal in the stock ration, no decays were seen.

The size of the particle of cornmeal affected its tendency to lodge in the crevices of the teeth. Finely-ground cornmeal that passed through a sixty-mesh screen had very little of this tendency, but forty-mesh screened cornmeal did stick in the teeth.

"It would appear desirable to give some attention in human dental studies to the physical properties of individual foods and of food mixtures with respect to their tendency for retention by the teeth," the investigators concluded. "It is apparent from the results that a diet considered adequate merely from the chemical point of view is not necessarily a guarantee against dental decay.—*Science News Letter, August*, 1, 1931.

* * * *

Progressive Poultry-Raising.

This is the title of a 222-page book by M.A.Jull, Senior Poultry Husbandman of the U.S. Department of Agriculture. The book is well illustrated and supplied with economic data. It is published by Armours Livestock Bureau, Union Stock Yards, Chicago, Ill., U.S.A.

It is a book intended for the progressive poultry husbandman. That poultry-raising in the U.S.A. has been progressive is evidenced by tables showing the value of poultry income from various sources compared to other crops and branches of agriculture. For the year 1928-29 the order of the first seven products in respect to the cash income they yield is dairy products, hogs, cotton, cattle, poultry products, vegetables, and wheat.

* * * *

India's Rural Problem.*

The first session of the All-India Rural Representatives' Conference was held at New Delhi at the Red Cross Society hall in the month of March.

The fudamental resolution adopted by the conference is as follows: "This All-India Rural Representatives' Conference is of opinion that the propositions adopted at this conference be considered as the basis of an all-India rural policy for consideration and discussion, and that opinions and suggestions be invited from all groups, bodies, and persons interested in rural affairs for consideration at the next conference.

The propositions from group A to F and general propositions adopted at the conference are: The immediate necessity for the examination and revision of land revenue policy and the land system; a judicial commission for zamindari rights; a tenancy commission for the charter of tenants' rights; rural labour inquiry; a registered money-lenders' association; conversion of the taccavi system into a banking system; the establishment of a rural development board, agricultural improvement trust, rural colonies, the village commonwealth council for reconstituting the villages as self-administering units as a part of the executive system, a rural areas educational council, a system of central rural schools; the need for a rural voluntary constabulary and rural statistics; the immediate necessity of an administrative recognition; and the organization of a rural water-supply system, rural electric supply and rural communications by roads and telephones in villages.

The other proposition recommended was to establish an agricultural tenants' corporation in the districts and a farm board, as in the United States. The policy of the conference was defined to be the utilization of every agency for the remaking of village life, and co-operation with all bodies and persons for the rural cause.

The General Council of some fifteen members of the Council of State and 45 others was constituted as the head of the body, with Mr. G. K. Devadhar as president; and an Executive Council was appointed, with Lady Vidya Gauri Raman Bhai as president and

**Pioneer, March 24th*, 1932.

Mr. Ramrai Mohan Rai as general secretary, with necessary powers.

* * * *

The Need for Milk Producers' Associationsin India.

In every town and city in India milk producers, dealers, hawkers, and private cow-keepers are at variance, and in a highly undesirable competitive state.

At present no attention is paid to regulate the milk supply in any way. There are yearly recurring periods of plenty and scarcity. During all times of the year adulteration and sharp practices and unsanitary methods seem to be the key-note of the milk trade.

In probably no other business does the efficiency of the milk business depend so much upon the integrity, honesty, and intelligence of the producer.

At present competitors distrust one another, whereas they should be able to trust and co-operate with one another.

The co-operative departments of the various Governments have a *real opportunity* to show the intrinsic value of co-operative principles in this line of enterprise. The difficulty lies in the fact that the co-operative departments are lacking in suitable men—men who understand both dairying and co-operation—for this work. It is the duty of every public-spirited man, woman, and child to study the problem, and do what can be done to assist.

* * * *

The All-roughage Ration.

A cow fed on roughage alone is limited in the amount of milk and butter-fat she can produce. The digestive capacity of cows is limited. Cows of high productive capacity cannot eat and digest enough food in the from of roughage to supply the nutrients required for heavy milk production. It is profitable to feed grain supplements to heavy producers, but it is not profitable to feed grain to mediocre cows whose production is not in excess of the nutrient requirements that can be met by the dry-roughage ration. For these reasons the dry-roughage ration is the most profitable for cows of low or average productive capacity; but a grain supplement becomes profitable when fed to cows of high productive capacity. It is poor business to underfeed good cows, and to overfeed all cows.

The question arises as to what are the low levels of production for the Indian breeds of cows that are satisfied by the nutrients of an all-roughage ration?

A common opinion among cattle feeders is that an animal giving 10 lbs. or less of milk per day can subsist on roughage alone.

The editor will be pleased to hear from practical feeders as to their experience.

Co-operative Marketing.

Marketing without any doubt is one of the major problems of the kisan. It is also a problem that lends itself very well to co-operative methods.

Co-operative marketing does not mean just finding a market for products. It involves the standardization of the products grown in a community, and the careful inspection and grading of these products before being placed on the market. In this way the demands of the tradeare met.

A co-operative marketing organization can build up outlets for products that are beyond the range of possibilities for the individual. Supplies and raw materials can also be purchased co-operatively.

Co-operation, however, is not a cure for all ills. It is a remedy, but requires careful attention, and must arise from a necessity.

Questions of religion and the peculiar characteristics and make-up of the local population and attitude have to be thoroughly considered in the formation of a co-operative marketing association.

LOSS BY EROSION IN INDIA

Dr. Sam Higginbottom

The greatest mechanical economic loss from which India suffers is the loss of fertile soil by erosion. As one travels up and down India, he cannot fail to be impressed as he approaches water-courses and rivers with the marks of erosion. Sometimes the eroded land takes on the nature of "bad lands." I think of stretches of the Punjab along the Jhelum; I think of stretches along the Jumna in the United Provinces, and along the Chambal in Central India along the Narbada and along the Krishna. In many parts of Central India formerly there was sufficient soil above the rock to guarantee for all time, as long as the soil remained, abundant crops. But in many places several feet of this good soil have washed away, leaving bare rock. The loss by erosion means a depletion of the farmer's most valuable asset. Soil is the most important integer of his capital. Without soil no crop is possible. The soil that is now being lost by erosion has taken unbelievably long periods of time to put into its present position. It is now being lost to the value of crores of rupees every year. India, through neglect, is losing its birthright.

The loss of fertility from soil due to bad methods of farming, the loss of stock due to epidemic disease, and almost any other farm loss, can be made good; but the loss of soil by erosion is complete and final. No replacement by any mechanical or economical means is known. This loss of soil is cumulative and pro-

gressive. Unless vigorous action is taken to prevent it, much land in India that is now culturable will soon be classed as unculturable waste, with consequent impoverishment of the whole country. Man will not be able to grow forest on much of it.

The loss by erosion is no longer a local or provincial matter. It is an all-India concern. It is so important that the Government of India would be justified in putting on the most highly-skilled engineers it could find to co-operate with the various provincial Governments and Native States' Governments to prevent further loss. A well-known geologist has estimated that the Ganges carries down eight times as much silt as the Mississippi. The very heavy downpours of rain in a short period of time are what do the most damage in India. Were the rainfall evenly distributed and gentle, not so much loss would accrue.

The Agricultural Institute at Allahabad is located on the south bank of the Jumna river. It adjoins on the east the embankment of the East Indian Railway. When we took possession of this land in 1912, it was badly gullied and eroded, so much so that much of it had been classed as unculturable. The lay of the land was carefully studied by the Institute staff. Bunds of earthwork, with pucca spill-ways, were put in at convenient places. In a few years very striking results were evident. Along the actual river-bank, which was deeply gullied, the mouth of every gully had been closed by an earth dam. The earth was taken from the river-side. The river was in high flood in 1916. The result was that, when the river went down, behind these bunds we had beautiful level fields. Some of the gullies, by actual measurement 17 feet deep and 60 to 70 yards wide, were completely filled with beautiful rich silt. Opposite the big brick arch of the East Indian Railway a masonry dam was erected. In three or four years beautiful rich silt was collected, about 8 feet at the deepest, varying in width from a few yards to 60 or 70 yards, and extending back nearly half a mile. At the south boundary of the farm there was one place where three streams came into one big nulla. Advantage was taken of two promontories of stiff black soil. A masonry dam, costing a thousand rupees, was put in. Within five years there was a fill of 14 feet of rich silt. This dam reclaimed nearly seven acres for the Agricultural Institute, and well over forty acres for our village neighbours. The land which had been the poorest in the village is now the richest.

The villagers have estimated that behind this dam, on soil which formerly grew very little, are grown crops to the value of several thousands of rupees every year.

There are millions of acres of similar land in India which could be reclaimed at very little expense of money capital. If the villagers were properly organized, and a scheme drawn up,

they could work at making these dams at those periods of the year when normally they have no work to do in connection with their agricultural operations. These dams would be in the nature of permanent improvements. Without somebody giving the lead, and guaranteeing to the man who does the work on the dam a certain share in the return from the improved land, little is likely to be accomplished. The soil reclamation branch, with skilled, trained officers, might easily be put under either the Department of Agriculture or the Department of Co-operation. I am writing about something that we know will work. We have been at it for a sufficient length of time to know that there is no risk of failure. I write to call attention to one of the greatest problems now before the people and the Government of India, pleading that some suitable steps be taken at an early date.

TWENTY-FIVE METEOROLOGICAL LAWS: VISHER*

In order that climatic factors, or the influences controlling climate, may be understood, a number of meteorological laws must be held clearly in mind. Twenty-five such laws may be stated briefly as follows:—

Group I.—Temperature

1. The earth's surface is warmed chiefly by solar radiation, and to a lesser extent by radiation from the warmed atmosphere.

2. The earth's surface is cooled chiefly by outward radiation to the overlying air, which is thereby warmed, and then usually rises, carrying the heat to higher levels, where it readily escapes into space. A secondary method of cooling is that which accompanies evaporation and thawing. A third method—radiation into space—is also important in high altitudes and in dry regions.

3. The lower atmosphere is warmed chiefly by the absorption of terrestrial radiation and to a minor degree by the absorption of solar radiation.

4. The lower air is cooled chiefly by convection, *i.e.*, the rising of the warmed air, and subsequent radiation to cooler air and into space. It is sometimes cooled by radiation to cooler land or water.

5. Vertical rays from the sun are more effective in warming the earth than are oblique rays; the more oblique the rays, the less heat received. Rays which are reflected from the earth have no effect on terrestrial temperature.

*Part of the introductory chapter of the book "Climatic Laws," published by John Wiley and Sons.

6. As all atmospheric molecules, and especially water vapour, interfere with the passage of heat, the drier and the thinner the air, the greater the heating by rays coming from the sun at a given angle, and the more rapid the cooling by night and in the shade.

7. Heat is carried from place to place mostly by winds, and to a lesser extent by ocean currents.

8. Water warms less easily, and more slowly, than land, and cools more slowly because (*a*) the specific heat of water is about twice that of land; (*b*) water is warmed to a greater depth, because of transparency and convection, and hence the surface layer is not warmed so much; (*c*) there is more reflection from water than from land; and (*d*) there is usually more evaporation from water than from land. The slower cooling of the water is because of (*a*) and (*b*), and because water vapour and clouds are more abundant over water than over land. Water vapour and clouds hinder the escape or heat.

9. The temperature of an object increases until the loss off heat equals the addition of heat. When the loss and the gain balance, the temperature remains constant. When the loss exceeds the gain, the temperature falls. Therefore maximum temperatures occur after the time of maximum loss of heat by radiation. In other words, there is a daily and seasonal lag.

10. Evaporation is a cooling process; when condensation occurs, as much heat is released as was required to evaporate the condensed vapour. However, since most condensation occurs high up in the air, where the heat can easily escape to space, the final result of evaporation is usually surface cooling.

11. Rapid descent warms air, while rapid ascent cools it. The adiabatic cooling of dry air while ascending is at the rate of 1°F. for each 200 feet approximately.

As a summary of these laws of heating, it may be well to picture the cycle due to their joint action. The sun rises; its rays penetrate the air, but are absorbed by the dark soil, which thereby is warmed and gives out long heat rays which are absorbed by the air. As the air becomes warm, it expands. Winds are set up, and the heated air is moved away and warms other places where the sun's heating is less effective. Sometimes the air rises, and is therefore cooled adiabatically, occasionally enough so that its moisture is partly condensed with a liberation of heat which still further warms the air. Gradually the heat escapes outward into space or downward to cooler earth and water until the air is no longer relatively warm. Then gravity pulls it down to the earth's surface, where it awaits another warming the following day.

Group 2.—Winds

12. Relatively cold air tends to sink, and crowd under warmer air, thus forcing it to rise. This is because cooling causes contraction and warming causes expansion, and hence a given volume of cold air is heavier than a like volume of warm, expanded air.

13. Winds always blow from places of higher air pressure to places of lower air pressure because the great force producing winds is gravity.

14. Winds are deflected by the rotation of the earth—to the right in the northern hemisphere and to the left in the southern. The extent of deflection increases with latitude.

15. Winds blow at a large angle with the isobars if there is much friction and at a small angle if there is little friction. In other words, if there is little friction, the air circulates round and round a centre of low pressure; but, where there is much friction, it approaches the centre of the low more directly.

16. Surface winds are influenced by topography and surface temperature. Winds tend to descend slopes, to follow valleys, to go toward warm areas, and to avoid elevations and cold areas.

17. Wind velocity depends on the barometric gradient, of difference in air pressure per horizontal unit, and upon the amount of friction; the steeper the gradient, and the less the friction, the stronger the wind.

Group 3.—Moisture

18. The ability of air (space) to hold moisture increases sharply with increased temperature, doubling with each increase of approximately 18°F. (10°C.) In other words, as the temperature rises, the relative humidity falls; this in spite of the fact that the absolute, or actual, humidity is increased with increased temperature whenever there is water which may be evaporated.

19. Atmospheric moisture is derived by evaporation from all moist surfaces, chief of which is the ocean.

20. The rate of evaporation increases with temperature and wind velocity, and with decreased relative humidity. It is also increased slightly by decrease in air pressure, in absolute humidity, and in the salinity of the water.

21. Atmospheric moisture is transferred chiefly by wind and the vertical moving of air called convection. (Diffusion, the other process of transference, is altogether subordinate.)

22. Condensation occurs when moisture is cooled below the saturation-point or dew-point.

23. The amount of condensation depends upon the absolute humidity of the air, the amount of vapour cooled, and the extent of cooling beyond the dew-point.

24. Precipitation occurs whenever drops, flakes, or pellets are formed which are too heavy to be sustained in the air by the rising air currents.

25. Precipitation is heavy when a large volume of warm moist vapour is cooled, notably below the saturation-point.

As a summary of these laws of moisture, it may be well to describe the cycle that often occurs. The sun rises over the ocean and the air is warmed. It thereupon becomes able to hold more moisture, and evaporation is facilitated. As the air is blown over the moist surface, it takes up moisture, rapidly if it can hold much more than it already has, and slowly if it is nearly saturated. The wind blows upon the land, carrying moisture from the ocean. It encounters a mountain range and is forced to rise. In doing so, its temperature is lowered. At a moderate height it is cooled sufficiently so that it can no longer hold all its moisture, and clouds form. At a higher elevation a drizzle is produced. If the range is high, or if convectional overturning takes place, rain falls until the excess moisture has been precipitated.

DRY COTTON DISCS ARE MOST EFFICIENT MILK STRAINERS*

Wire-gauze has been Discredited as a Material for Removing Foreign Materials from Milk

G. Malcolm Trout (Section of Dairy Husbandry)

Despite all precautions to exclude foreign materials from milk, an appreciable amount of sediment finds its way into the milk supply during milking and subsequent handling. The presence of this sediment makes straining of the milk before sending to market an imperative operation. During certain months of the year tests are made at many market milk plants to determine the amount of sediment present in the milk purchased. The results of these tests, when compared to standard charts, give a definite idea concerning the cleanliness of milk production, and also a numerical rating which affects the final total score of the milk examined.

Because of its inefficiency, its source of contamination, and its condemnation by city milk ordinances and milk inspectors, the wire-gauze strainer has been relegated to the past in Michigan market milk circles. In its place, various kinds of cloth and cotton pad strainers are being used. During the past winter several trials were made at this station to determine the comparative values of several types of strainer materials. Eight different kinds

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of strainer cloth materials and cotton pads were used. Eight of these were used in the standard stamped milk strainer, which consists of the strainer proper, the concave perforated disc, and the securing ring. The strainer materials consisted of two different makes of common cotton discs, on gauze-face reinforced cotton discs, squares of flannel, percale, doubled cheese cloth, muslin with the fibre side up, and muslin with the fibre side down.

Three gallons of whole raw milk, to which were added exactly five grammes of very finely-pulverized dirt, were strained through each type of strainer at temperatures of 95°,80°, and 60°F. In one series, all the strainers were wet with water before admitting the milk, while, in a second series, all the strainers were dry. The efficiency of the strainer in removing the dirt is shown in figure 1. The sediment discs show the amount of the dirt per pint which passed through the dry filter when the milk was at a temperature of 95°F. At this temperature the milk passed through the strainers, whether wet or dry, very rapidly. However, at 80° F., the time required for the milk to pass through the strainers previously wetted with water was considerably longer than that required for a similar lot to pass through the dry strainers. Different periods of time were required for the milk to flow through the different wetted strainers, depending upon the thickness and nature of the material. When the strainer was previously wetted, the water which first came in contact with the strainer seemed to dominate the strainer and let the milk, which is an emulsion of fat and water, flow through with difficulty. Furthermore, the wetted strainer was much less efficient in removing the sediment from the milk.

The flow of milk through the strainers at 60°F. was so slow that it would be impractical to attempt to strain milk at that temperature.

The meshes of the cheese cloth were so large that practically all the sediment passed through without difficulty, even when the cloth was doubled. One thickness of percale used as a strainer could easily be classed with cheese cloth in respect of rapidity and efficiency.

Muslin, either with the fibre side next to the milk or opposite, was little better than cheese cloth or percale in removing the sediment from milk. However, when used with the fibre side next to the milk, more efficient straining resulted than when the strainer cloth was reversed.

Of the various cloths used, flannel was most efficient in removing dirt from the milk, although the efficiency could not be compared with that obtained by the use of the various cotton pad strainers.

Three different kinds of cotton strainer pads were used. Each was very efficient and rapid in removing the dirt from the milk,

especially when not more than 10 to 15 gallons of milk were strained through the same pad.

A second series of experiments consisted of straining 40 gallons of milk at 95°F. through each of the three cotton strainer pads and through the most efficient cloth – flannel. A sediment test was taken of the original milk, and again after each 10-gallon portion had passed through the strainer. The sediment discs secured are shown in figure 2. In general, the flow was considerably decreased after the first 10 gallons had passed through the strainer. Often it was necessary to administer a slight jar at the beginning or soon following the introduction of the second 10-gallon portion. The tests showed that in every case jarring was unsatisfactory as it reduced the efficiency of the strainer. The last 10-gallon portion yielded a sediment disc showing as much sediment as the sediment disc of the original milk before straining. Jarring seemed to make small holes in the strainer pads which resulted in uneven straining, and through which the previously collected dirt passed readily.

Time is an important factor in straining milk. When not more than 10 gallons of milk were strained through each strainer pad, the difference in time required with the different strainer pads was of little practical importance. In every case considerably more time was required to strain the second 10-gallon portion. In some cases the time required to strain the second 10-gallon portion was over twice that required to strain the first 10-gallon portion.

In strainer pad number one the flow of milk stopped after 18 gallons had passed through. It was necessary to give the strainer a slight jar to start the flow again. Other jars were administered after 20, 25, and 28 gallons of milk had gone through. From that point on continuous agitation was necessary to get milk through the pad.

Similar experiences were encountered in strainer pad number two. Milk ceased flowing after 15 gallons had flown through. Jarring the strainer was necessary at that period, as well as after 18, 22, 25, and 27 gallons had been strained. Continuous jarring was necessary from that period to start and maintain the milk flow through the strainer.

Strainer pad number three required less jarring. Flow of milk first ceased when 26 gallons of milk had been strained through the pad. After 30 gallons had been strained continuous jarring was required.

Strainer pad number four permitted the milk to flow through without much jarring of the strainer. Although the flow had not ceased, a vigorous jar was given the strainer after 10 gallons had passed through. Further jarring was not necessary. The fibres seemed to break apart, which permitted a steady, rapid flow.

SWEET COTTAGE CHEESE

Dairy Department, Agricultural Institute, Allahabad

Cottage cheese is undoubtedly the most popular of the many types of soft cheeses. It is usually characterized by a sour or acid flavour and mushy appearance, which is due to the presence of whey in the curd. By varying the ordinary method of manufacture it is possible to almost entirely eliminate this sour whey from the curd and produce a cottage cheese with a delicious sweet flavour, firm body, and consequent popularity. The method and temperature used in cooking are largely responsible for the expulsion of the whey.

Milk Used.—Only sweet, clean skim-milk, which has been pasteurized, is used. The most preferable method of pasteurizing is to hold the milk at 145°F. for thirty minutes. It may be flashed heated at 160°F. If the milk is to be stored or shipped, it should, immediately after pasteurizing, be cooled to 40°-45°F.; but, if it is soon to be made up into cheese, it will be necessary to cool only to the setting temperature, which is 68°-70°F.

Setting the Milk.—No exact temperature at which it is best to set the milk can be given, but ordinarily 68°-70°F. gives good results. When the temperature is correct, lactic acid starter is added to the extent of $\frac{3}{4}$ of 1 per cent to 1 per cent; and, in order to insure uniform coagulation, it must be thoroughly mixed with the milk.

To each 3,000 pounds of milk are added 3 to 4 cc. of a 25 per cent solution of calcium chloride. This is to replace some of the salts destroyed by pasteurization, and is very important if the full effect of a coagulant is to be obtained.

One cc. of Hansen's Cheese Rennet is added to each 3,000 pounds of milk. Both the rennet and the calcium chloride should be diluted with plenty of cold water (about forty times their own volume) and thoroughly stirred into the vat of milk.

Since the appearance of any food product has considerably to do with its sale, it will be found desirable to add enough Hansen's Cheese Colour to give the finished cheese a rich creamy appearance. This colour is very strong, and only small amounts are needed. Start, for example, with $\frac{1}{4}$ ounce for each 3,000 pounds of milk; and, if that is not sufficient, the next day increase the amount of colour until the proper amount is found which gives a desired shade of colour to the cheese. Always dilute the cheese colour with water, just as is done with rennet. Never mix the rennet and cheese colour, but thoroughly stir the colour into the vat of milk before any rennet is added, and always add cheese colour after the starter has been added.

Milk is allowed to curdle to what a cheese-maker terms a "clean break." This is determined by inserting the finger in the curd obliquely and slowly raising it to break the curd. The curd should break fairly clean over the finger. The setting time required to obtain this coagulation will probably be 12-14 hours, but will vary considerably, due to local conditions. It is well to set the milk at 4 or 5 o'clock in the afternoon, and then the curd will be ready to cut the first thing in the morning.

Cutting the Curd.—The acidity of the whey at cutting is from ·56 to ·62. The curd is cut in exactly the same manner as an ordinary cheddar curd. It is cut lengthwise of the vat with the horizontal knife, and then lengthwise and crosswise with the vertical knife, to form cubes of the curd. Always insert the knife so that it will cut its way into, and not break up, the curd. Since the size of the curd particle is a factor controlling the development of the cheese, the development will not be uniform unless all particles are of the same size. Most makers will find the finished cheese will have a much better appearance if the curd is cut into large particles. Knives, which cut the curd into $\frac{3}{4}$ to 1 inch cubes, are about the right size. Of course, the curd shrinks considerably when cooked, so the finished cheese particles will be much smaller than $\frac{3}{4}$-inch sized cubes. The cooking process is started as soon as the curd is cut.

Cooking the Curd.—Extreme care is required at this point as the curd may be easily ruined for making good cheese. Live steam is *never* used to cook with, but a water-jacketed vat is used; and one must be sure the water does not leak out and allow live steam to take its place. Have overflow pipe at water-level desired, and keep small amount of water running out. The curd is heated very slowly, and stirred only occasionally. The stirring should be just sufficient to insure the heat being evenly distributed throughout the mass of curd particles. If the temperature is raised too rapidly, a tough cooked film will surround each particle, making it impossible for the whey to escape from the centre of the curd. No set rule as to how fast to apply heat can be given, but good makers are not disappointed if two hours are required to bring the curd up to 100°.

A good device for stirring curd when it is soft may be constructed as follows: Attach $\frac{1}{2}$ or $\frac{3}{4}$-inch board about 6-8 inches wide and 2-3 feet long at right angles to the end of a wooden handle. One edge of the board may be tapered off, and the device will then appear like a scraper. This device, when pushed across the vat, scrapes up each particle of curd at the bottom, and seems, if carefully handled, to break up the curd even less than hand stirring.

As curd particles become gradually warmer, the whey will tend to be driven out more rapidly, and the rate of cooking can be

increased. The curd particles will shrink and become more and more firm as the whey is expelled, and a stage will finally be reached where a rake may be used to stir the curd. At that point the heat is applied more rapidly, and the stirring must become more frequent.

Determining When the Curd Is Sufficiently Cooked.—No written rules can take the place of experience and observation, and good cheese-makers carefully observe and study each curd from day to day. No two curds are exactly alike. Sometimes 110°F. is high, enough and then again a cooking temperature of 140°F., or even 150°F., may be required.

One of the first indications of sufficient cooking is that most of the curd which has been floating will sink to the bottom of the vat. This is because the whey is expelled; and the curd is heavier than the whey it displaces. Press a particle of the floating curd with the thumb. If a dent tends to remain for a minute, the indication is that the whey is out of the centre of the curd.

Break open a particle of the curd. It should, when finished, break clean, leaving a glossy, smooth surface at the breaking-point.

Put a handful of curd in a pail of cold water and stir. Note how much the curd shrinks. Gather up and curd press the together gently in the hand. If the curd particles mash up like ordinary cottage cheese, they are not done. On the other hand, if, when released, they spring apart, each particle retaining its original shape, and they are "live," and somewhat rubbery, the cooking is probably finished. The curd should be cooked dry enough so that a yield of 13-15 pounds from each 100 pounds of milk will be obtained.

Removing the Whey.—Push the curd to the back end of the vat and drain exactly as in draining a cheddar cheese vat.

Washing the Curd.—Wash the curd two or three times to wash away all traces of whey. Use planty of cold water, and, when the wash water is perfectly clear, it indicates that the whey is removed. No pressing or draining of any kind is required other than to allow the curd to drain about 15 or 20 minutes in the bottom of the vat. The curd should then be put in a cooler at 32°-35°F. and allowed to set overnight.

Creaming and Salting.—The demand for the product will be increased if, after the curd is cooked, a small amount of fat is added. This is best added in the form of rich cream exactly as is often done with ordinary cottage cheese. The demands of the market and the price obtained will determine the amount of cream to use. Ordinarily 2 to 4 per cent fat in the finished cheese is sufficient. The mixing may be done by hand or mechanically, as is most convenient. Salt at the rate of approximately 10 ounces to each 100 pounds of curd should be added at the same time as the cream.

DRY SURPLUS FRUITS AND VEGETABLES*

Methods of Drying

Preserving Foods by Drying may be done in four ways.

By Sun Drying.—Spread the prepared food in wire or netting trays, cover the netting to keep the food from insects, and dry in the open air. This method is useful in dry, hot weather.

By Artificial Heat in the Oven or a Special Drying Apparatus.—When drying food in the oven, place it, properly prepared, on clean platters, dripping pans, or trays. Leave the oven doors open during the process. Rapid ventilation is essential to success.

By Air Blast Created by Electric Fan.—By combining any of the above methods. Many find it desirable to start the drying process in the oven and complete it in the sun.

Ten Rules for Drying

1. *Use Good Material.*—Food selected for drying should be in the same condition as that selected for immediate table use.
2. *Work Rapidly.*—All food and vegetables should be dried as quickly as is consistent with good results.
3. *Slice Large Foods To Get More Drying Surface.*—Small fruits, vegetables, some berries, mature beans and peas, and small onions may be dried whole. Larger fruits and vegetables should be cut so as to expose more surface for drying. The usual way of doing this is to slice them.
4. *Do Not Overheat.*—If the food is to be dried in the oven, the temperature should not be too high, otherwise, the food will cook rather than dry. Use low heat throughout the entire process. At the beginning the oven should be somewhat cooler than the latter. The temperature should never exceed 140°F. The use of a thermometer helps to avoid overheating. A cooking thermometer may be kept in the oven while the food is drying by placing it through two corks in which holes have been punched.
5. *Be Sure Food Dries Evenly.*—Food should be stirred frequently during the drying process. This prevents overheating and the growth of moulds.
6. *Keep Food Free from Dust and Insects.*—Foods dried out of doors must be protected from flies and other insects. Mosquito-netting or cheese cloth stretched on frames may be used. Always be careful to avoid dust.
7. *Prevent Dampness.*—Do not allow food to become damp during the drying process. It is better to bring food which is becoming sun-dried indoors at night.

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*Agricultural Extension Service, University of Wisconsin, circular No. 86.

8. *Conditioning.*—All food should be thoroughly dried before it is stored. It is best to allow it to remain in a dry place for several days, turning it frequently in the meantime; this permits more complete and effective, drying. The process is technically known as "conditioning."

9. *Storing Dried Food.*—Store dry food in paper bags, boxes, or tin containers, such as pails and cracker boxes. These should be kept in a dry place, free from insects.

10. *Save Cooking Liquid.*—Soak all dried food 24 hours before cooking. Cook in the water in which it has been soaked; allow this to evaporate to small bulk, and serve with the fruit or vegetable, or use in soups or sauces.

How to Dry Vegetables

Corn—Method 1

Immediately after picking and husking, place the ears in unsalted, boiling water for 5 minutes to set the starch and "milk;" plunge into cold water; drain or wipe with clean towel; cut kernels from cob, being careful not to cut too close to the cob. Use sharp knife. Dry by any of the suggested methods, preferably in the oven.

Corn—Method 2

Husk freshly-picked corn, remove tips and kernels with sharp knife or cabbage-slicer; extract pulp or "milk" by scraping with a blunt knife; mix thoroughly; partially dry by placing corn pulp in a pan over hot water until mixture thickens. Spread on clean dripping-pans or platters; stir occasionaly while drying; when thoroughly dry, condition and pack.

String Beans—Method 1

Directly after picking, string the beans, wash in cold water, drain on soft paper or towels; cut in 1-inch pieces or slice lengthwise; dry by artificial heat.

String Beans—Method 2

Directly after picking, string and wash beans, plunge immediately into boiling water for 5 minutes; then plunge into cold water; drain on soft paper or towel; cut into desired form—either 1-inch pieces or thin slices cut lengthwise—and dry by artificial heat.

If beans have become to old to use as string beans, allow them to ripen; then shell and store.

Green Peas

Shell freshly-picked peas, steam 10 minutes or boil 5 minutes in covered kettle with a small amount of water; plunge into cold water, drain and dry by artificial heat for 6 or 8 hours.

Greens and Herbs

Spinach, beet, greens, lettuce, dandelions, and chard supply mineral material and other necessary food substances which may be lacking in the winter diet. As great a variety of these as possible should be dried.

Herbs are also valuable since they add variety to the flavour of winter foods. Celery tops, parsley, mint, sage, onion tops, pepper, and cress are useful for this purpose.

All green herbs should be carefully picked over and washed in several waters. They may be steamed 10 minutes before drying. The quicker oven method of drying makes them retain their natural colour and flavour better. Only in very hot, dry weather should the sun-dry method be used. Dry thoroughly, condition, and pack.

Pumpkins and Squash

Prepare by steaming, boiling, or baking; mash and spread on clean dripping-pans or platters, and dry in the oven, stirring frequently; condition and pack as indicated for corn.

Pumpkin and squash may be sliced and dried without previous cooking.

Other Vegetables

Any other vegetables, such as carrots, turnips, and potatoes, may be dried. This, however, should be done only when storing facilities are poor, or when the product is to be shipped a long distance. Wash, pare, or scrape; cut into quarter-inch slices; dry and pack.

How to Dry Fruits

Small Fruits and Berries

Small berries, such as blueberries, currants, gooseberries, raspberries, and even cherries and grapes, can be very successfuly dried. The length of time required is from 6 to 8 hours.

Use only sound, unbruised fruit; wash clean and drain on soft paper or clean towel. Spread on clean dripping-pans or platters, and dry in oven. Be careful that the oven is not too hot in the beginning. A low temperature (110°F) at first will be all right. If this is gradually raised to 130°F or 140°F., the best results will be produced.

Berries may be successfully dried in trays in the open air where the weather is hot and dry.

Apples and Pears

Wash fruit, pare, core, and cut into ¼-inch slices, dip immediately into a weak salt solution made of three level table-spoonfuls of salt to one gallon of water; drain; spread on trays, dripping-pans or platters; dry until somewhat leathery; condition and pack.

Rhubarb

Select young stems of rhubarb, wash and cut into ½-inch pieces, using a very sharp knife. If the skins are not removed the rhubarb retains its pink colour. Dry, condition, and store.

A CRITICISM OF THE REVIEW OF AGRICULTURAL OPERATIONS IN INDIA, 1928-29

(Government Press, Calcutta, 1931, Rs. 3-2)

Sam Higginbottom, Agricultural Institute, Allahabad

This report came to hand in December, 1931. It runs to 251 pages. It is hard to understand why a report of so much importance to the majority of the people of India should be delayed so long. Much in it is now out of date.

The report, as usual, deals with the main crops of India, giving acreage and yields. It tells of improvement of the various crops; also of diseases and pests, of cattle-breeding, of agricultural engineering, agricultural education and co-operation, etc. It should be on the table of every intelligent landlord and educated farmer in India. It contains valuable information in concise form.

And yet—some things strike one as being far from what they should be. The record of what is being done is imposing; but the record of what ought to be done, and is not being done, and for which no thought apparently is being taken as to how it can be done, is very disturbing. This is an official publication, and mentions chiefly what officials are doing. Would it not be well to pay more attention to what private enterprise, often with official co-operation, is doing? What the official does, he does because it is his duty to do. When he goes, it may die. What the non-official is doing is a measure of agricultural progress among the people, and a record of it is of more importance than the record of official action.

To study the receipts and expenditure of the agricultural and veterinary departments is a depressing experience. When one thinks that India is primarily an agricultural country, the sums spent on research and improvements are pitiful; one wonders why Government does not suppress the figures. They are so damaging when published.

	Rs.
The net expenditure of the Imperial Department of Agriculture (page 189) was	11,14,485
The net expenditure of Provincial Departments (page 190) was	1,05,63,165
The net expenditure of Veterinary Services (page 191) was	44,18,369
Total Rs. ...	1,60,96,019

This means that the annual expenditure for agricultural improvement works out in British India to about one anna per head of the population. The increase in income to the cultivators of India due to the improvement of crops and methods is measured in crores of rupees every year. This surely is justification for Government to expand these departments. Yet these departments are usually the first to suffer in times of retrenchment. The increase in money in the United Provinces due to improved sugarcane in 1928-29 is estimated at Rs. 3,11,50,000, or about twice as much as the total cost of all the agricultural departments in India.

Modern agriculture is a science. As such, it ought to deal with facts. One fact is worth much more than many opinions. Yet in this volume opinions are freely expressed, where facts are needed. The facts may make the opinions that have been expressed seem wide of the truth.

The "expert" who writes on cattle-breeding expresses the opinion that "so long as milk production is not raised to such a high standard as to cause loss of vigour, this may do no harm." That is, his opinion is: that to breed an animal for large milk production is likely to lead to physical deterioration. One would like to know upon what basis such an opinion is formed. What facts are known seem to point in the other direction: that to increase the milk production of a breed leads to increased physical vigour of that breed. To produce a large amount of milk makes greater physical demands upon a cow than to produce smaller amounts of milk. Such an opinion as quoted above in such a document is likely to do much harm. Just as similar statements made in the report of the Linlithgow Commission are hard to overcome as it is

considered the last word on the subject. These opinions need facts to substantiate them.

One great difficulty in the agricultural service in India is that a man who is a specialist in one particular branch of agriculture, and fully competent in his own line, is often put in the position of a director of agriculture, where he is supposed to be able to give an expert opinion on every branch of agriculture. The sad thing is that he often falls into the temptation to speak with the voice of authority when he has not adequate training and knowledge so to speak. Page 133 has much debatable material expressed with finality. A few facts would be of greater value.

The press has recently carried items of news regarding proposed retrenchment in the agricultural services. Government seems disposed to kill the goose that lays the golden egg. There is a proposal to close down the dairy education work at Bangalore, also the work in animal nutrition—two of the fundamental needs of Indian agriculture. To close these activities at this time will cause a waste of public money. Programmes begun years ago, are being carried out that are full of promise. If these are now shut down, much of the money spent will be a loss. Specialists trained for such work are not easy to find, and, when found, should be used to their full capacity.

We all know the present is a time of world-wide agricultural depression. What then should be the policy? The Government of India thinks that to close down all it can in the matter of agricultural improvement is the right policy to pursue. The words of one of the leading rural economists of the world, Professor G.F.Warren, of Cornell University, may be timely: "If the trouble is overproduction, the charge that extension work and scientific research are to blame may have a grain of truth in it. But if the trouble is monetary, and if we must learn to produce at a profit with prices at pre-war levels, and wages far above pre-war, then there was never before a time when research and education should be pushed with more vigour. Farmers must know how to adjust and act quickly.

"Scientific research, agricultural extension teaching, the use of improved machinery, greater output per man, are not the causes of the depression, but are the major ways in which the depression can be met. The farmer, the manufacturer, or the country that cannot increase efficiency quickly will be left behind" (Page 482, "Scientific Agriculture," Ottawa, April, 1931).

With all its activities, there is as yet neither in the imperial department, nor in any provincial department, a report of rural economics or agricultural economics. It is almost inconceivable that at such a time, when there is world-wide agricultural depression, the various Indian Governments should be content to get along without the most important single factor in finding a way out of

this slough of despond. No departments are more needed to-day by the Imperial Government and the various Provincial Governments than for each to have a strong, well-staffed department of rural and agricultural economics. Valuable as are the services rendered by some of the Indian university departments of rural economics, these are inadequate. Most of the university staffs are properly trained for this work. Money spent in these departments should give a large return, but indirect.

There is a chapter in agricultural engineering where the record of work being done is stated. But here again it may be questioned whether the title of the chapter is not misleading. There are good mechanical and electrical and civil engineers in the employment of the various agricultural departments. No dissatisfaction with these men when they are doing the thing for which they are trained and qualified. But I question whether any provincial department of agriculture has in its service what is known in Canada and the United States as an "Agricultural Engineer;" that is, a man trained in agriculture, and also trained in the engineering problems of agriculture. I have known of a first-class mechanical engineer who had no knowledge of field conditions being employed as an agricultural engineer, with disastrous results. There is no bigger field, or greater need, for investigation in India to-day than the field of agricultural and farm engineering. If the British universities do not as yet train agricultural engineers, the Canadian and American universities do, and suitable men can be secured if they are sought in the proper quarter.

Let us hope that an awakened public opinion will make itself felt by exerting pressure on the various Governments to urge them to do work that means so much for the economic well-being of India.

SOME ABSTRACTS OF REPORTS OF THE INTERNATIONAL DAIRY CONGRESS, 1931

Professor Savage reports that protein does not appear to have any stimulating effect on milk secretion. Further, that a 16 per cent protein concentrate ration is as effective as a 20 or 24 per cent protein mixture, provided that a good grade and allowance of roughage are fed.

Forbes and Kriss point out that no satisfactory method exists for determining the net-energy values of individual feeding-stuffs for maintenance, body increase, or milk production. He proposes a new and simple feeding standard for dairy cows by utilizing the net-energy value of rations, instead of the values of individual feeds. A feeding standard for dairy cows is given in terms of

metabolizable energy, as well as equivalent quantities of total digestible nutrients.

Gowen presents a study of different measures of determining a sire's breeding worth. He points out that at the present time the measure best adopted to common use is the sire's progeny performance.

Steensberg reports the results of experiments in feeding fresh sugar-beet pulp. He points out that fresh sugar-beet tops are well suited in case of butter production, and that ensiled tops may be a good feed if the tops are clean before being ensiled.

Professor Anthony presents a résumé of the organization, development and functions of Dairy Cattle Breed Associations in the United States. Cattle are not native to the United States, the first importations being made in 1535 by early English settlers. The early Herd-book Societies developed into the existing Cattle Breed Associations. These associations are independent, and have no Government connections. While only a small percentage of dairy farmers are members of these organizations, and only a small percentage of the total dairy cattle population are registered with these organizations, yet they definitely control the breeding stock of American dairy herds.

Ostergaard, from a statistical study on the milk-yield of some Danish herd-book cows, concludes that: (1) the maximum yield of the herd-book cows occurred about 30-40 days after calving; and (2) the influence of pregnancy on the course of lactation curves did not begin to make itself felt until the middle of the period of pregnancy.

Crichton reports that the supplemental feeding of iodine had a beneficial effect on the health and percentage of butter-fat of the milk of those cows under experimental conditions, but does not consider that the present knowledge warrants a general practice of feeding iodine to dairy cows.

M'Candlish points out that root crops, particularly swedes, form the main winter succulence for dairy cows in Scotland. He points out that, on light land, roots should be grown for dairy cows, and that, where the soil is heavy, the roots can economically be replaced by silage or dried sugar-beet pulp.

Sheehy points out that in the great majority of cases the feeding of dietary fat had no influence whatever on the butter-fat yield of the milk. The feeding of cod-liver oil and linseed oil had depressing effects.

Eckles points out the nutritive requirements of the growing calf. The average productive life of the dairy cow in the U.S.A. is five and one-half years. The raising of the calf is relatively easy when skim-milk is available. Calves may suffer from mineral deficiencies under commercial conditions.

Buchanan points out that some of the factors governing the total yield of milk are inherited in a sex-linked manner.

Mattick reports experiments, the results of which confirm the earlier results, and demonstrate clearly that the dietetic value of milk is reduced by heating.

[*Note.*—The Editor will be pleased to supply further information to those interested in the conference papers.]

THE COMPOSITION OF MILK

Professor W.J.Hansen

There is no absolute standard composition of milk. In the last article published—"The Story of Milk Manufacture in the Udder"* – it was stated that all milks contain the following constituents in more or less amounts:—

Water	Albumin
Fat	Ash (Mineral)
Milk Sugar	Gases
Casein	Enzymes

and colouring matter.

These constitutents are naturally present in all milks, but not in absolute or fixed amounts. It is one of the peculiarities of nature that the composition of milk varies with the species. The composition of Human, Cow, Goat, Sheep, Buffalo, Camel, Horse, Ass, and Reindeer milks vary considerably from each other in the amounts of milk constituents which they contain.

The following table† gives the composition of human milk and that from common domestic animals:—

Composition of Milk of Various Species

Species	Water percentage	Fat percentage	Protein percentage	Lactose percentage	Ash percentage
Human	88·30	3·11	1·19	7·18	0·21
Goat	87·88	3·82	3 21	4·54	0·55
Cow	87·25	3·80	3·50	4 80	0·65
Sheep	80·82	6·86	6·52	4·91	0·89
Mare	90·70	1·20	2·00	5·70	0·40
Water Buffalo	76·89	12·46	6·03	3·74	0·89
Reindeer	67·20	17·09	9·89	2·82	1·49
Camel	87·61	5·38	2·98	3·26	0·70
Sow	84·09	4·55	7·23	3·13	1·05
Bitch	78 88	8·56	6 82	4·09	1·08
Cat	81·63	3·33	9 08	4·91	0·51

*See Volume VI, No. 1, "The Allahabad Farmer."

†"Milk and Milk Products"—Eckles, Combs, and Macy.

Human Milk.—Nature has provided most animal mothers with milk fo the infant. Nature particularly intended that the human infant should be supplied with human milk—the milk of its mother. It frequently happens that the infant is deprived of mother's milk either entirely or in part. The milk of other animals then must be used. Cow's milk is the most common substitute for human milk. The most striking characteristics of human milk as compared with other milks are its low casein and ash content. As we compare human and cow's milk, we note the difficulties involved in the modification of cow's milk for infant feeding. For instance, if water is added to cow's milk to reduce the casein to the proper value found in human milk, the albumin, lactose, and fat are reduced too far below the proper values. To solve this difficulty, these three constituents must be added in proper quantity and form. When a delicate balancing of cow's milk to simulate exactly that of the mother's milk is required, such modification is practised in adding water to cow's milk to lower the casein; them, by adding top milk or cream together with a commercial sugar such as lactose, the raising of the other constituents is accomplished to a certain extent.

Colostrum, the fluid secreted by the mammary gland shortly after parturition, is materially different from milk. There seems to be a gradual change in its composition during the first five to seven days, after which the secretion is normal milk.

Colostrum concededly has an important place in the nutrition of the newly-born animal. It seems to have an important relation to the stimulation of the new processes of digestion. It also plays an important role in building up an immunity to disease in the blood of the young animal. The composition of colostrum and the progressive change to milk are shown in the following table:—

FIGURES SHOWING THE PROGRESSIVE CHANGE OF COLOSTRUM INTO MILK

Time after Calving	Casein, per cent	Albumin per cent*	Ash, per cent	Total Solids, per cent	Coagulates on Boiling	Sugar, per cent	Fat, per cent
At once ..	5·08	11·34	1·01	26 99	Yes	2·19	5·10
6 hours .	3·51	6·30	0·91	20·46	Yes	2 71	6·85
12 ,, .	3·00	2·96	0·89	14·53	Yes	3·71	3·80
24 ,, ..	2·76	1·18	0 86	12·77	Yes	3·98	3·40
30 ,, ..	2·56	1·20	0·83	13· 3	Yes	4·27	4·90
36 ,, ..	2·77	1·03	0·84	12·22	Yes	3·97	3·55
48 ,, ..	2·63	0·99	0·83	11·46	Yes	3·97	2·80
72 ,, ..	2·70	0·97	0·84	11·86	No	4·37	3·10
96 ,, ..	2·68	0·82	0·83	11·85	No	4·72	2·80
5 days	2·68	0·87	0·85	12·67	No	4·76	3·75
7 ,, ..	2·42	0·69	0·84	12 .3	No	4 96	3·45

*The figures for "albumin" really represent albumin and globulin.

From the table overleaf it will be noted that the albumin (globulin) content is markedly greater than in normal milk. The albumin in some samples has run higher than 16 per cent. The percentage of fat, casein, and milk sugar are lower in colostrum. The ash content is higher than in normal milk: it may be twice as high in some cases. The total solids content may even go to 28 per cent in colostrum. An important characteristic is that of coagulation of the albumin when heated. Colostrum is not palatable as a food because it is often quite viscous, is bitter in taste, has a strong odour, and is decidedly more yellow than normal milk. Health ordinances prohibit the use of colostrum in the regular milk supply until five days after calving. It will be noted that normal milk is reached at about this period of time. Colostrum is a food delicacy to some people. The writer knows of certain classes of people who make puddings and cake from it. This is the exception rather than the rule.

Difference in Composition of Cow's Milk

Any variation in the fat content of milk gives concern to the dairyman. Since the fat is the important constituent, and the one which is most liable to variation, it should be worth our time studying the possible causes of such variations. These differences in composition are of such importance that commercial practices are influenced by them. For instance, the practice of standardization has come about to meet these variations.

Milk from certain dairies or from certain breeds is mixed with other batches in the plant vats so as to produce a uniform product day after day. If milk were processed and bottled can by can, a most uneven product would result.

The solids not fat are also affected by the many factors which vary the fat; but, so far as our study is concerned, such variations will not be considered in great detail.

It has been found that the fat of milk may go as low as 1·4 per cent, and as high as 12·52 per cent. Such extreme variations are quite abnormal. We can, however, be safe in stating that fat content seldom falls below 2·5 per cent, or rises much above 7 per cent. The fat content of milk from a herd of cows does not vary to such a great extent, but remains within narrower limits.

The chief factors which cause the composition of milk to vary are—

(1) Breed of cows;
(2) Individual cows;
(3) Time between milkings;
(4) Portion of milk drawn;
(5) Age of cow;
(6) Advance in lactation;

(7) Season of year;
(8) Feed (Kind and quantity);
(9) Management and enviroment; and
(10) Disease.

1. *Difference in Composition of Milk Due to Breed.*—Variations due to breed are of the greatest importance. Two outstanding characteristics which are attributed to breed are the quantity of milk produced and its richness in butter-fat. The following table is a compilation from several sources, and shows how the important dairy breeds rank as to the quantity and quality of milk.

It will be noted that the milk from the Channel Island breeds—Jersey and Guernsey—produce a high fat-content milk. The Milking Shorthorn and Ayrshire breeds produce milk of medium richness, while the Holstein produces a milk of lower fat content. It might also be pointed out that the reverse order prevails when the quantity of milk produced by these breeds is concerned. As we study the table, we also notice a continuous decrease in total solids as we read down from Jersey to Holstein. This decrease is made up of differences of all four solid constituents.

While these variations are not as marked as in the fat, we are safe in saying that a high fat milk also carries a high solids-not-fat content. Since the difference between 100 and the total solids gives the water content of the milk, it is important to note the variation in this constitutent from the point of view of food content. This may be more an apparent advantage than a real one since it is believed by many that high fat content, together with large-sized fat globules, is not as readily digested as low fat milk containing small fat globules.

2. *Difference in Composition of milk Due to Individuality.*—Milk from individual cows even of the same breed may show considerable variations in composition. This will occur even under identical conditions of care, feed, and environment. The factor of inheritance is probably the outstanding one of many that may contribute to such variations. The following are average yearly tests for the highest and lowest testing animals in each breed according to complete records by Eckles:—

Breed	Number of Cows	Highest per cent of Fat	Lowest percent of Fat
Jersey	76	7·00	4·47
Shorthorn	25	4·31	3·59
Holstein	40	3·81	2·60

Usually the cows giving milk with a high fat percentage are more likely to show individual variations in other constituents than those giving a milk of low content.

3. *Difference in Milk from Same Individual Cow Due to Time between Milkings.*—The fat content is the most variable of the milk constitutents which change between milkings. When the length of time between milkings is the same, there is a tendency for the morning's milk to test slightly higher than the night's milk.

There is a greater difference in the fat in the two milkings in this country because there is usually a greater lapse of time between the night's and the next morning's milkings than between the morning's and the night's milkings of the same day.

4. *Differences Due to Portion of Milk Drawn.*—The fat content of milk increases markedly during the milking process. The first milk drawn (fore-milk) is very low in fat content, containing only a few tenths of a per cent of fat. The last milk or strippings will test as 8 or 10 per cent. Typical variations are shown in the following table from Van Slyke:—

VARIATION IN FAT CONTENT OF MILK DURING MILKING

	Cow No. 1, Fat per cent	Cow No. 2, Fat per cent	Cow No. 3, Fat per cent
First portion	0·90	1·60	1·60
Second portiion	2·60	3·20	3·25
Third portion	5·35	4·10	5·00
Fourth portion, strippings	9·30	8·10	8·30

In practice, it is essential that milking be efficiently and completely done.

5. *Differences Due to Age of Cow.*—The following quotation from Eckles sums up the effect of age upon the composition of cow's milk: "On the average, a well-grown two-year-old may be expected to produce 70 per cent, a three-year-old 80 per cent, and a four-year-old 90 per cent, of the milk and fat that she will produce when mature. The average fat content remains practically constant from year to year, except that, after the cow is eight or nine years old, the percentage of fat always declines slowly and gradually with advancing years."

6. *Influence of Advance in Lactation.*—The quantity of milk and the percentage of fat in it under most conditions remain fairly constant during the first few months of the milking period. After

about the fourth month there is a gradual decline in the amount of milk produced, and a steady increase in its fat content. Individual cows differ, however, in the rate of this increase in fat content. In this connection, we might note the effect of the cow's condition or fatness at calving time upon the subsequent milk composition. Dairymen making big short-time records follow the practice of getting the cows excessively fat before calving. This is done because for a limited time the fat content of the milk can be materially increased by this plan.

7. *Effect of Season of Year on Fat Variation*.—There is a definite seasonal variation in the percent of fat from an individual or herd. This is a variation not due to food because it has been proven experimentally where food conditions were kept the same. The point of highest fat test is in America in December and January, and the low point in June or July.

8. *Influence of Food on Milk*.—It is a common belief that the food which a cow receives is the all-important factor governing the quantity and quality of milk production. Many a farmer has expressed to the writer his uncompromising belief that such and such a fat test must be wrong because he is feeding some particular brand of feed. Scientific investigations, however, have not entirely confirmed this belief. Attempts at feeding fat into milk by mixing substances rich in fat with the food have not been successful. As soon as a cow adjusts herself to any of these food changes, the milk maintains its normal fat content.

The chemical nature of the fat may be decidedly affected by food, but the amount of fat is not so affected. When a poorly or underfed herd is placed on a well-balanced ration, it is true that an increase in the quantity and quality of milk will result. This change, however, cannot go beyond the limit which the breed or individual is capable of producing. Observations by the Copenhagen (Denmark) Station over a period of ten years, and including about 2,000 cows, led the observers to conclude that foods high in protein content may possibly raise the fat content of the milk to the extent of 0·1 per cent—scarcely an increase at all.

The apparent benefit to be obtained from proper feeding is that of increasing the production to the limit. With such an increase in the amount of milk, one would expect a greater amount of fat production. The percentage of the fat test of the milk would not be increased, but more fat would be obtained because more milk of average fat test had been obtained.

9. *Effect of Management and Environment*.—Any abrupt changes in weather, environment, or management which tend to set up an abnormal condition within the cow will cause a decrease in flow. For a short period of time the fat test may raise slightly,

but it is only temporary. The reaction generally means a lowering of the fat.

Lack of exercise reduces the milk flow, but the milk is then richer in fat. Excessive exercise unfavourably influences the amount and kind of milk produced.

Any abnormal or adverse nervous influence impairs the milk supply. Ill-treatment, sudden fright, and the like materially reduce the quantity and quality of the milk.

The manner of milking or the changing of milkers has been thought to produce effects on the quantity and quality of milk. It is obvious that, if a milker is careless in dealing with the fore-milk and strippings, the fat content of the milk will be materially affected.

10. *Effect of Disease on Composition of Milk.*—There has been considerable differences of opinion relative to the effects in composition of milk due to disease. The farmer, of course, is interested in this phase of the subject because any abnormalities in milk composition might indicate to him the presence of disease. Then again milk may be fraudulently adulterated by bringing about some change in the cow by the use of disease conditions or drugs, the idea in the latter case, having in mind a possible raising of the fat content. So far as we are concerned, it might be well to classify briefly the conditions which might affect the udder. Any disease in the udder itself directly affects milk secretion, and usually such diseases show a marked reduction in both milk and milk-fat. Diseases in other parts of the body, not affecting the secreting tissue, do not affect particularly normal milk secretion. It is believed, for instance, that any digestive disturbance due to disease or artificial means causes the fat to be increased rather than decreased.

Standardization.—Mention has already been made to the practice of standardizing milk in milk plants. This insures a milk of uniform test, and smoothes out the variations in fat that might otherwise occur. The dealer automatically or intentionally can standardize. The farmer has a greater problem when he attempts it. He does not have so great a bulk of milk with which to work as does the plant-man. The law does not allow "adding anything to, or taking anything from, milk." The farmer with low-test milk therefore can add no cream, or remove any skim-milk, and do it without adulteration of the ilk. Some talk of late has been advanced, in America, looking toward legalizing the adjustment of fat in milk. Such an aim would be to permit a farmer to standardize, for instance, from a 3·5 per cent milk to a 4·0 per cent milk. Uniformity in test and quality is the talking-point, but it seems to present difficulties which are better handled under the strict application of our adulteration laws.

AVERAGE COMPOSITION OF MILK OF SEVERAL BREEDS OF COWS

Breed	Yearly Milk Yield, pounds	Water, per cent	Lactose, per cent	Protein, per cent	Fat, per cent	Ash, per cent	Total Solids, per cent
Jersey .	5,508	85·27	5·04	3·80	5·14	0·75	14·73
Guernsey ..	5,509	85·45	4·98	3·84	4·98	0·75	14·55
Ayrshire ..	6,533	87·10	5·02	3·34	3·85	0·69	12·90
Shorthorn	5,500	87·43	4·89	3·32	3·63	0·73	12·59
Holstein ..	8,699	88·91	4·65	3·15	3·45	0·68	11·93

VOL. VI

No. 3

THE ALLAHABAD FARMER

इलाहाबादी किसान

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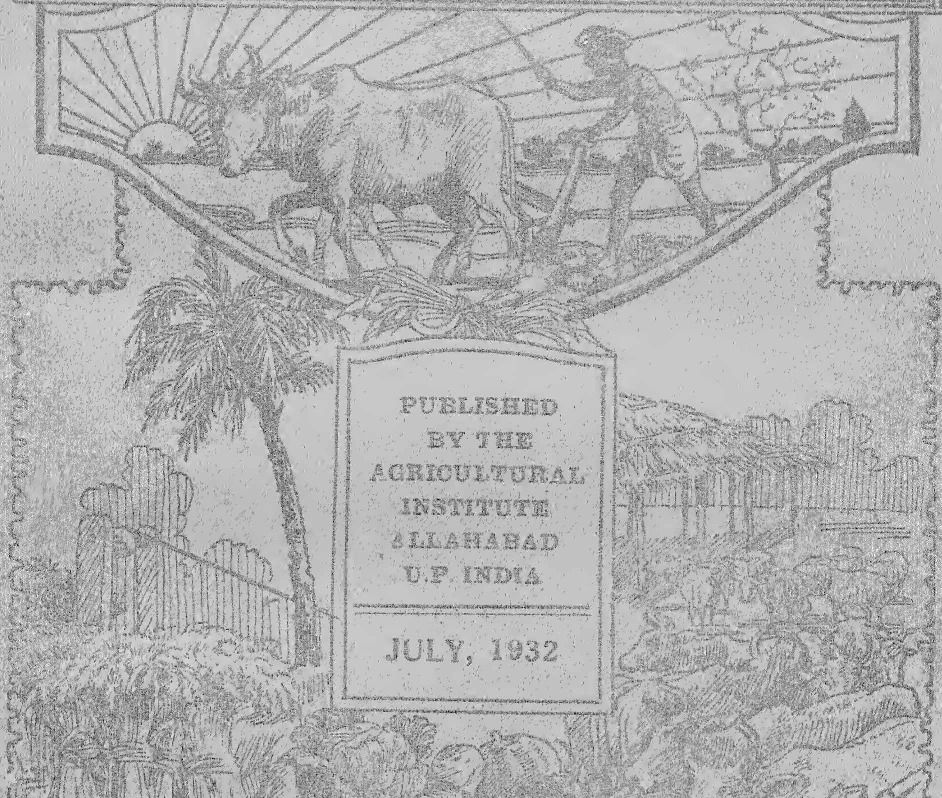

"On all sides, there is an awakening in India. But it is a misfortune that this has occurred at a time when civilized mankind in general is rapidly adjusting its institutions and its modes of thought to the needs of urban and industrialized populations. What India really requires is, first of all, a quickening of interest in rural life and the needs of the countryside; the real life of India is to-day still in the villages, and her great hope for the future lies in the uplift of the agriculturist."

SIR WILLIAM MALCOLM HAILEY, Governor, United Provinces, India.

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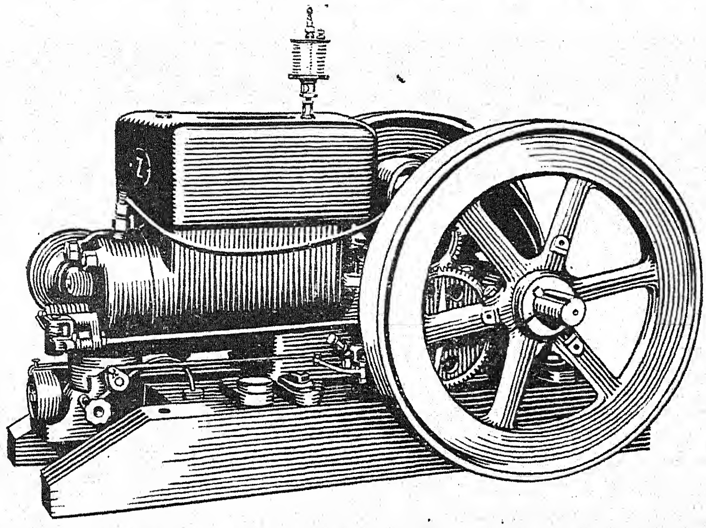

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Allahabad Agricultural Institute

PURPOSE

The Agricultural Institute was founded in 1910 by the American Presbyterian Mission. By giving men both practical and theoretical training in modern methods of scientific agriculture and dairying as well as a thorough general knowledge of the sciences underlying these, it hopes to help India fight its problem of poverty.

LOCATION

The farm and grounds of the Institute are across the Jumna River from Allahabad proper, about three miles from the Allahabad Station (E. I. R.) and two miles from the Naini Station (E.I.R.) Besides being easily accessible, it is very beautifully located on the banks of the Jumna River.

STAFF

The staff consists of twelve men, Indians and Americans, trained in agriculture, dairying, engineering, and sciences.

A. P. Brooks

VOL. VI No. 4

THE ALLAHABAD FARMER

इलाहाबादी किसान

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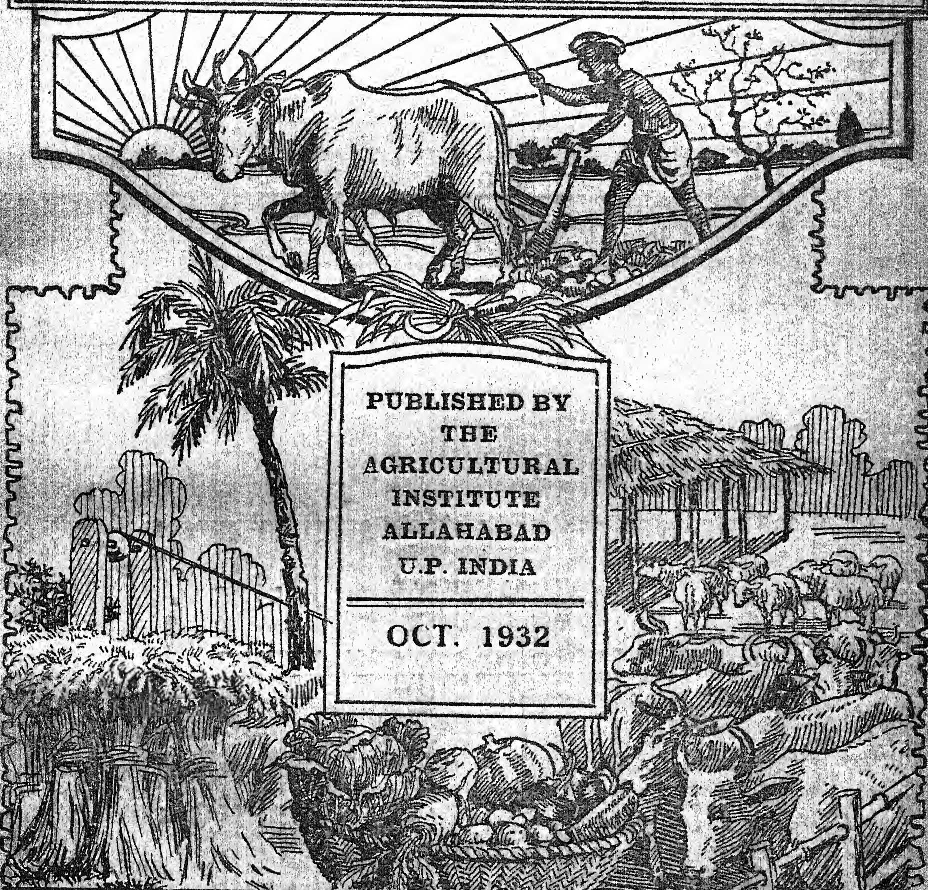

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ALLAHABAD
U.P. INDIA

OCT. 1932

"Much has been said and much has been written of Rural uplift. Such uplift to be permanent, however, demands in the first onset the organization of the wherewithal by which the wealth of the villagers can be increased. The future of Rural uplift in India, therefore, rests in the formation of "Better Farming Societies", the consolidation of the holdings and eventually on the communal farming of the village area. To put 'Better living' before 'Better farming' in an Indian Village is in my opinion a waste of time and energy."

ROBERT G. ALLAN,
Director of Agriculture, United Provinces.

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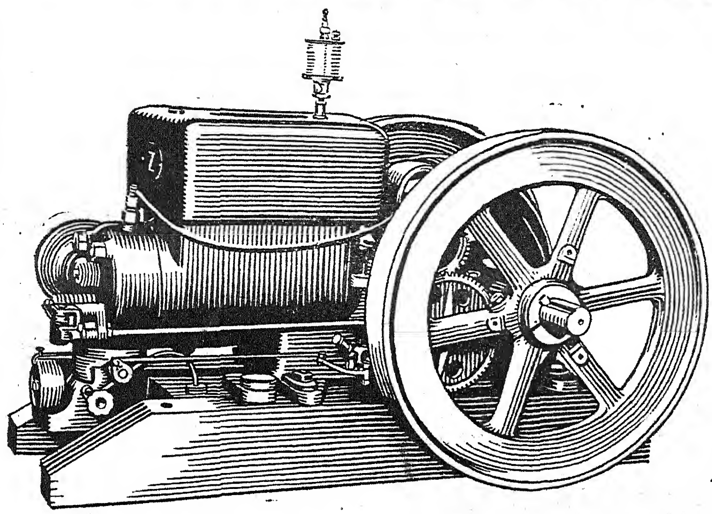

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The Allahabad Farmer

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Undenominational in Scope and Interests

VOL. VI OCTOBER, 1932 No. 4

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VOL. VI] OCTOBER, 1932 [No. 4

ACROSS THE EDITOR'S DESK

Just as we are going to press the following message comes from the Honourable Minister for Education and Industries, United Provinces:—

"Our politicians differ on many points, yet all have at least one principle in common—the vital importance of raising the standard of the agricultural production of this country, and with it the well-being of the teeming millions whose welfare rests thereon. By no means can this be achieved except by the furtherance of effective research and experiment, so that our practice, founded by empirical means through centuries of experience, may be vitalized anew, as elsewhere in the world, to greater production."

J. P. S. SRIVASTAVA,
M. Sc., A.M.S.T., M.L.C.,

* * * *

BARODA RESIDENCY.

DEAR EDITOR,

About the middle of February we set out 40lb. of Napier grass roots, a few in the garden, where they got regular watering, and the rest in a plot, where they had water from the dhobi's tank. At that time we offered roots to a few village-men, but they all said, "You try it first. If it grows here for you, then we shall consider trying it."

On returning from an early holiday on the 1st May, we found the grass had grown to 4 feet, and was being fed to the buffaloes. A month later there was another cutting. This time we left two

bunches to see how tall they would grow. They have reached 8 feet, and are still growing. We shall use them for cuttings to start new plants. The original roots are now being divided and replanted. Some of our friends in Baroda have taken roots to plant in their gardens, but no villager has yet been persuaded to try this new grass in his fields.

"Goats never eat grass," is a common saying. Now our servants modify it by saying, "They eat this, but not any other kind."

Our patch of land is rather low, and the test of heavy rains is yet to come. So far, Gujarat seems quite suitable for the cultivation of Napier grass.

Yours Sincerely,
L.E. HUFFMAN.

* * * *

Notes on Napier Grass

Napier grass is said to be common in South Central Africa, but its cultivation as a special fodder crop has come into practice only recently. Its heavy yield of green fodder, its drought resistance, and its palatability mark it with great possibilities as a fodder crop.

Napier grass is propagated by stem-cuttings, roots, or rooted slips. On the Institute Farm planting of Napier has been done mostly by cuttings. The latter should have two or three nodes, and should be taken from mature plants. They should be planted flat and covered with soil like sugar-cane. If sowing is done in the rainy season, which is probably the best planting time for this grass, it should be planted on ridges. Ridges can be made with a double mould-board, plough, or phawra. The distance should be about 3½ feet ridge to ridge. If all the nodes germinate, plants should be thinned to about 2 feet apart. In months other than rainy ones they should be planted in ditches (furrows). When the plants are about 1 foot high, they can be earthed up again so that the plants are on ridges. They can also be sown on flat ground in rows and ridged up later. Rooted slips should be planted singly in rows. It can be planted at any time, except possibly the very dry months of May and June. On our farm we required about 1,000 pounds of cuttings to plant 1 acre.

Napier grass can be grown on any soil except stiff clay and waterlogged lands. Medium loam is best. Land should be free from weeds, and well drained. During the preparation of land for Napier grass the field should be manured with farm-yard manure, 20 cart-loads per acre. After each cutting intertillage should be done with a cultivator, and the field irrigated. If available, a top dressing of five cart-loads of well-rotted manure should be given

once a year. A handful of ground castor-cake dibbled round each plant greatly helps.

Napier grass may be cut from three to twelve times a year, giving a yield of from 25,000 lb. to 200,000 lb., or even more, a year per acre, depending on the richness of the soil and on irrigation. Our 1-acre plot of Napier grass planted in the second week of March, 1931, on manured, sullage-irrigated soil yielded about 82 tons (2,200 maunds) of green fodder in a period of 6 months; i.e., May to October, in four cuttings. The estimated cost of production is 2 annas per maund.

Napier grass should not be allowed to grow too big when cut for feeding. It is highly relished by cattle, as is clearly noticed on the Institute Farm. If it grows a bit thick, it can be cut with a chaff-cutter or ganda, and then given to cattle. The oftener it is cut, the better the quality of the fodder and the greater the yield. It also makes good silage.

The Institute can supply Napier roots at Rs. 5, and cuttings at Rs. 2, per maund for planting. For planting, roots are better than cuttings as they stand long transit, delay of planting, and dry season better than cuttings. Cuttings are good for planting during the rainy season.

* * * *

Wool Production and Trade within the British Empire and Foreign Countries.

This subject is comprehensively treated in a recent Empire Marketing Board bulletin under the title of "Wool Survey," price 25 shillings net, from His Majesty's Stationery Office, London.

Wool, next to cotton, is the most important raw material of the textile industry. About three-quarters of the world's supplies of wool for clothing purposes are produced in New Zealand, South Africa, and South America. Wool, however, is produced in almost every country of the world. In the world markets there is a wide elasticity of demand, whereas in the production areas there is a relative inelastic supply. This situation results annually in marked price fluctuations. The present low price of raw wool is not an isolated occurrence, but will be followed in due course by an upward movement. No adequate substitute for wool has yet been invented, and new uses for wool are being explored in order to counterbalance the effect that artificial silk has had on the industry.

Wool is essentially an Empire commodity, and pastoral interests are intimately bound up with the condition of the wool-growing industry. Sheep and wool statistics of many countries are inadequate, and need to be improved before the prospects of the industry can be gauged.

The following table gives the distribution of sheep in the principal countries of the world:—

Date	Country	In Millions
1930 ...	... Australia	107·0
1931 ...	... South Africa ...	49·8
1931 ...	... New Zealand ...	29·8
1931 ...	... United Kingdom ...	26·2
1931 ...	... British Provinces in India	25·2
1930 ...	... Indian States	16·3
1931 ...	... Canada	3·61
1931 ...	... Irish Free State ...	3·6
1930 ...	... Argentine	44·4
1930 ...	... Uruguay	20·6
1929 ...	... Brazil	7·3
1932 ...	... U.S.A.	53·9
1928 ...	... Central America ...	3·16
1931 ...	... Soviet Russia	112·2
1929 ...	... Spain	19·4
1930 ...	... Roumania	11·9
1930 ...	... France	10·2
1930 ...	... Italy	9·9
1928 ...	... Bulgaria	8·0
1930 ...	... Yugoslavia	8·0
1929 ...	... Greece	5·8
1931 ...	... Germany	3·5
1925 ...	... Portugal	3·7
1930 ...	... Turkey	10·5
1930 ...	... French North African Colonies	18·2

*   *   *   *

Facts to Remember.

It should be encouragement for cattle-breeders in India to know that there are good prospects ahead.

During 1920 a cow named Segis Pietertje Prospect, owned by the Carnation Milk Farms, Seattle, U.S.A., produced more milk than any other cow of any age for all time has ever produced, namely, 37,381·4lb.

Two years later she made another record which established her as *Champion of the World* for two years, milk production (72,931·8lb).

Many of our readers may remember the world sensation created in 1918 when Mr.E.A.Stuart, of the Carnation Milk Farms, purchased a six-month old bull for 106,000·00 dollars, the largest sum ever paid for a single bull. This bull, later named Carnation King Sylvia, has proved to be one of the greatest bulls of all time. Such is the value of a good blood line and pedigree.

Controlling Stomach Worms in Sheep and Lambs.

In nearly every part of the world where sheep are produced the stomach worm is one of the most serious menaces to the sheep industry. Leaflet No. 89, issued in March, 1932, by the U.S.D.A., Washington, deals fully and concisely with this marginally-noted subject.

* * * *

Copper sulphate has been found effective in 97 per cent of cases, and is safe when properly administered.

The dosing solution is prepared by dissolving $\frac{1}{4}$ lb. copper sulphate (blue-stone) in 1 pint of boiling water, adding enough cold water to make a total of 3 gallons. This is practically a 1 per cent solution, and is enough to dose 100 adult sheep. Adding 1 oz. of a 40 per cent solution of nicotine sulphate to each gallon of the 1 per cent copper sulphate solution will control some of the common tapeworms as well. Three ounces is the dose for sheep 1 year of age and older and about half as much for lambs from 3 months to 1 year of age. Animals to be dosed should be fasted overnight.

* * * *

Sex Reversal in a Bullock—*Madras Agricultural Journal, Vol. XX, No. 8.*

Mr. S. Krishnamurthi Rao, B.Sc., Ag., writes from Dharmavaram: A strange phenomenon of the development of the udder in a bullock has happened of late in a neighbouring village of this town. The bullock, owned by a private ryot, belongs to the Mysore breed of cattle. The animal was purchased by the person in Kothacheruvu cattle fair eight years back and was broken for work at the time of purchase. The animal is strong and well built, and is now thirteen years old. Till very recently, it was put to agricultural work and was very serviceable to the owner; but after the development of the udder it is given complete rest and is now being worshipped by the villagers, one and all!

History of Development of Udder.—About three months back the owner noticed an abnormal swelling in the region of the scrotum, and, native medical aid proving a failure, the animal was taken to the veterinary sub-assistant surgeon at Dharmavaram. The veterinary doctor, after examining the case, advised the ryot to take the animal to the District Veterinary Hospital at Anantapur for proper treatment. The owner, realizing later that there was no necessity for medical aid, gave complete rest to the animal. The swelling was found to increase enormously in size after some time, though the animal was quite healthy, and it suffered no pain even when the portion was pressed by hand.

The abnormal growth increased in size. Along with the development of the udder, the rudimentary teats also increased in size, and were well formed. It was plain then that the animal was developing its udder. One day the ryot, as a matter of curiosity, milked the well-formed teats, and he was surprised to see milk coming out in a fine jet from the milk ducts. This news spread soon far and wide like wild-fire when the people gathered in great numbers at the place to see the animal.

* * * *

Up from Poverty.

This is the title of a new book just received from the Oxford University Press, P.O. Box 31, Bombay, price Rs. 2-8-0, author: Dr. D. Spencer Hatch, published in June, 1932.

We can recommend this book to every one of our readers, and can further say that no one who is endeavouring to keep abreast with rural problems can afford to be without this book on his bookshelf.

The whole theme of the book is "self-help: with expert guidance." Dr. Hatch enumerates various ways in which he has been able to cope with village problems.

Some of the chapter headings are as follows: Some Fundamental Needs; The Problem of Leadership; Cottage Vocations The Rural Demonstration Centre; How We Teach Rural Vocations; How We Use the Co-operative Method; Tackling the Problem of Leadership.

The Oxford University Press has published a prospectus, and will be pleased to send copies to any of our readers who may be interested in the book.

The price of the book brings it within the reach of all.

THE STORY OF CYRUS H. McCORMICK

Inventor and Pioneer Manufacturer of the Reaper

This is the story of Cyrus H. McCormick, inventor and pioneer manufacturer of the reaper, who probably did more for the advancement of modern farm machinery that any other one man. There is no doubt that his development of the mechanical grain harvester has been one of the vital influences in the making of America.

McCormick was born in the year 1809 on a farm in Rockbridge County, Virginia. In the same year Abraham Lincoln was born, and destiny was to weave together the lives of these two men in a strange pattern. In that year there were approximately as

many people in the entire United States as 100 years later were in the two cities, New York and Chicago.

Farming methods were little changed from ancient times. Harvesting was still mostly done with the sickle, although some used the scythe and a few used the cradle. Bread grain was produced with an enormous expenditure of human labour, and one man could handle only a few acres. Wheat was so scarce that, even up to the year 1858, it was many times imported to feed the people of America. In 1809, when McCormick was born, it was only 15 years since George Washington had made the oft-quoted statement, "I know of no pursuit in which more real and important service can be rendered to any country than by improving its agriculture."

Into this young country which had won political freedom, but which was still bound to the slavery of hand labour, was born Cyrus McCormick. His father was owner and operator of 1,800 acres, and had on his farms two grist mills, two saw mills, a blacksmith shop, and a distillery. The father was an accomplished worker in wood and metal, and in the course of his farming he devised a hemp brake, a clover huller, a bellows for the forge, and a threshing-machine. In the home, as young Cyrus was growing up, shoes were cobbled, flax and wool were spun and woven, candles were moulded, soap was made, and all the domestic processes of putting up food supplies were carried on.

As a boy, Cyrus was an active worker on the farm and in the shop, learning handicraft from his father. He went to a crude log school, and was known not as a brilliant student, but as a steady worker. At 18 he studied surveying, as did Washington and Lincoln and many other young men of that day when new land required much measuring, and he made himself a surveying instrument that showed marks of skill.

Many men were starting in those early years of the century to devise harvesting machinery, but they were failures and great jokes with the neighbours.

In 1831 the first great principle of the successful reaper was devised by young Cyrus, a reciprocating knife, predecessor of the present-day sickle of mower and binder. The serrated cutting edge, like the present sickle sections, the fingers against which the grain was cut, and the reel were rapidly added as the energetic young man studied the apparatus in the field.

Remember that in the entire United States in that year, 1831, there were only 82 miles of railroad track and one or two locomotives. The B. & O. Railroad was experimenting to determine the relative merits of horses, locomotives, and sails as a means of propelling their train. There was not a free library in the entire country. There was not a house in the whole State of Iowa. Ind-

ians still wielded the scalping-knife in Illinois. The source of the Mississippi river was yet unknown. A letter sent from New York to Boston cost the price of half a bushel of wheat.

Remember also that the now rich America, which has helped to feed the world, was then poor and hungry. As late as 1837 there were bread riots in New York and near-famine conditions often prevailed. In those years, instead of saying "Eighteen hundred and thirty-one," discouraged people often said "Eighteen hundred and starve to death."

So in this dismal and unreceptive year of 1831 Cyrus McCormick, 22 years old, carted his improved reaper to a little gathering at Steele's tavern and gave an exhibition near the end of the harvest season. With two horses he cut 6 acres of oats in one afternoon, equal to the work of 6 labourers, with scythes or 24 with sickles. This was important, but only a few people saw it. The following year, 1832, he took an improved machine over to John Ruff's farm, near Lexington, where several hundred people gathered to watch. The field was hilly, and the machine slid around and failed. The farmers yelled to him to stop and get out as he was ruining the grain. The crowd jeered and whooped for they knew all the time it would be a failure.

Then up stepped William Taylor, who owned the field of wheat adjoining, and invited McCormick to take down the rail fence and go over into his field. This field was level. The machine worked perfectly, and in the afternoon 6 acres were cut neatly and cleanly. The machine was placed on exhibition in the public square in Lexington, where it was examined by curious crowds. A Professor Bradshaw, who looked it over, declared it was worth 100,000 dollars. He was right, only he had left off eight or ten ciphers.

The first reaper was offered for sale in the year 1833, price 50 dollars, but it was nine years before the first one was sold. He worked steadily on the farm improving, trying to make money enough to buy the needed iron. In 1836, not being able to secure iron in any other way, he organized a company and purchased a near-by ore bed and furnace tract, and in the following year began to smelt his own iron.

Being 6 feet tall, and weighing near 200, lb. he did most of the heavy work himself. The year he started this little smelter saw the birth of a boy in Scotland, who was named Andrew Carnegie.

In 1837 the whole country was swept by a terrible panic. Bankruptcies were on every hand. The McCormick property, except the home place, was consumed in an effort to pay their debts. One day a constable came with a summons for a debt of 19·01 dollars, all that remained unpaid of a debt of 72·00 dollars,

but he refused to serve the summons, and the bill was later paid. Strangely enough, none of the creditors paid any attention to the reaper, nor took it seriously. Within two decades it was destined to earn millions of dollars.

Desperately trying to sell machines, young McCormick gave demonstrations, showing that with the two men and a team he could cut 2 acres of wheat in an hour; but there were no buyers. The first sales were made in the year 1840, consisting of two machines; in 1842 there were seven reapers sold at 100 dollars apiece, but some of them he did not collect for; in 1843 he sold 29; in 1846, 190. The machine was then known as the Virginia Reaper and success had become a possibility.

By that time the prairies had begun to loom large in the agriculture of America. The steel plough was unlocking the rich, level acres. A trip across Ohio, Indiana, and Illinois convinces the farmer-manufacturer that his machine would do its great work in the prairie country. So in 1848, having already sold 46 machines in Indiana and Illinois, McCormick moved to Chicago and established a factory, in partnership with William Ogden, first mayor of the little city. The factory stood beside the Chicago river east of the bridge, that to-day carries an unending stream of automatic traffic. It was the largest factory in the city, and the immense sale of reapers unquestionably was a large factor in bringing the golden stream of wheat that made the beginning of Chicago's greatness.

In 1849 came the rush for gold in California. Men by the thousands dropped their tool in the prairie states and hastened West to find easy wealth. McCormick saw instantly that this meant a shortage of hand labour for the harvest, and would book the demand for reapers. So, pushing production to the utmost, he advertised widely and arranged to place supplies of reapers where they could be purchased quickly when harvest emergencies arrived.

The reaper, at this time, was crude as compared with present-day models. It had the sickle, the reel, the bull wheel, and the platform; but, as the wheat fell on the platform, a man sitting or standing at the end raked it off in gravels to be picked up and bound by hand.

One of the first great legal battles for his rights in the machine came in 1855, and McCormick's attorney was Reverdy Johnson, United States Senator from Maryland. Counsel on the other side included Lincoln and Edwin M. Stanton. Stanton made a powerful plea and won the case against McCormick. Lincoln received a fee of 1,000 dollars, his first large fee, but, more important, he was so impressed by Stanton, that later, as President, he chose Stanton as his Secretary of War. Little did he dream that this

reaper, a few years later, was to be a leading factor in holding together the Union during the Civil War.

The enormous portent of the reaper in the world's history was demonstrated in the Civil War period. That war, like the World War a decade ago, was fought as much in the wheat-fields as on the fields af actual battle. With Lincoln calling for more and more soldiers, with the country stripped of its able-bodied men, with women and boys running the farms and trying to produce food for the armies, the struggle was intense. According to all preceding history, the North should have faced starvation. Yet, to the amazement of the world, wheat production increased steadily; and, besides feeding itself and its armies, the Union was able steadily to increase the amount of its wheat exports. This brought ready money. It stabilized the nation's credit in Europe. The reaper replaced the man-power of the North, accomplished by machinery more than the slaves had ever accomplished for the South. Who can tell what might have been the outcome without the reaper?

In 1874 came the first hint of the "self-binder." A man named Withington, watchmaker by trade, came from Janesville, Wisconsin, to explain a device for binding bundles automatically by wire. The device was put into service, and the first demonstration of the self-binder was held on a farm near Elgin, Illinois, in July, 1875. For five years the binder, using wire, was the leader amongst harvesters. But the wire was objectionable; and, when a man named Deering in 1880 brought out a twine binder, he sold 3,000 of them as fast as they could be supplied.

The next year McCormick came out with an improved twine-binder, and started a battle with Deering that lasted until the forces were united in 1902, eighteen years after McCormick's death. The rapidity with which harvesting machines were taking hold may be seen from the fact that in 1880 the total of all machines sold was 60,000, in 1885 250,000, and by 1914 the total number of binders sold exceeded one million aunually and were exported to every agricultural country in the world.

A few years previous to the World War the advancing cost of farm labour made manufacturers turn their attention to what is now termed the Harvester Thresher or Combine. Though perfected no more than 10 years ago, many thousands of these Combines are being exported annually to Australia, Africa, the Argentine, Canada, and also into Europe. The machines work better in dry areas, and, with the aid of two men and a tractor, the Combine will cut, thresh, clean, and sack 30 acres of grain per day at a very small cost.

McCormick died in the year 1884. He had fought through life for a single idea, and he lived to see his catalogue printed in

twenty languages. He made millions of dollars for himself, but he made billions for the world. More than any other one man, he destroyed the fear of famine and lifted the yoke of labour slavery from the shoulders of farmers the world over.

CEMENT FLOORS

MASON VAUGH, B.Sc., Ag., A.E., ALLAHABAD

Scarcity of timber, and the white ant, make wooden floors such as are used in Western countries unsuited to India. Many different materials—stone, tile, brick, lime, and others—have been used, singly and in various combinations, with indifferent results. In the larger centres, where skilled workmen are available, it is possible to get really nice tile or patent stone floors laid, but the cost is usually quite high.

There is a demand for a smooth, impervious floor surface which can be made cheaply and by local labour. It should be smooth, strong enough to resist wear, and should not crack, and so let the dreaded white ant through. The most common method of meeting this demand has been to attempt the use of cement in one of several ways. While concrete in various forms has been used to some extent, the most common method has been to put down about four inches of lime concrete, made with lime, sand, and broken brick, bed the whole brick on edge on a layer of sand, one inch or more in thickness, sweep the cracks between the brick full of sand, and then plaster the top of the brick with a thin coating of cement. This results in a nice surface originally, but one which is usually not durable. Some blow displaces a brick, the cement cracks, ants carry out the sand, and soon the floor is in bad condition.

As the result of a series of experiments, a method which gives good results, at a cost not a great deal higher, has been developed at the Allahabad Agricultural Institute. On the properly-settled earth approximately four inches of broken brick, kankar, gravel, coarse coal clinkers, or any similar material is laid and rammed hard. This is not really essential, but will help to prevent damp floors. No lime at all should be used in this material. It is not only unnecessary, but seems to be actually objectionable. If available from an old building, a little old plaster may be put on top to close the surface, as fine material is put on a macadam road just before it is finished. Should old plaster not be available, a little fine kankar or coal ashes may be used. Water should be used to help make the material consolidate. First-class bricks are not necessary; any grade may be used, and it is not essential that the material be broken to any uniform size.

On the prepared sub-base sand or sifted coal ashes should be spread just thickly enough to bed evenly the brick to be used for the floor proper. For ordinary bungalow, school, or hospital floors, the brick may be laid flat. For workshops, or other large floors subject to heavy traffic, they may be put on edge. They should be laid to a line to get them placed evenly on top, and care should be taken to leave from $\frac{3}{16}$ inch to $\frac{1}{4}$ inch crack between bricks, both on the sides and on the ends.

The brick should then be sprinkled with water as long as it readily absorbs the water put on it. Enough water should be used to thoroughly dampen the sub-base also, but excessive water should be avoided, as it will weaken the cement work. It is desirable to have the brick take a small amount of water out of the cement. but of course it should not be much.

The cracks between the bricks should then be filled with a mortar of one part cement and three parts sand. If it is necessary to sacrifice some strength to cheapness, and if the sand is coarse and clean, one part cement and four parts sand will serve. If the sand is very fine and very high strength is required, the sand may be reduced to $2\frac{1}{2}$ parts. Under ordinary conditions 1 to 3 is satisfactory. The mortar should be mixed with rather more water than for bricklaying, and should be either swept into the joints with a heavy broom or raked back and forth with a trowel until the joints are well filled. Inserting a trowel between two bricks and working it back and forth will help. Only the minimum water necessary to get the cracks well filled should be used, as more will tend to wash the cement out of the sand and to weaken the cement not washed out.

Wherever possible, the grouting of the cracks should be carried out in the morning and the surface should be plastered in the afternoon. If the room is large, and only a few men are available, the plastering may be done the next day. For ordinary conditions the surface may be plastered with the same mortar as was used for the grouting. Care should be exercised that all dirt carried on to the grouted floor on the feet of workmen, and all laitance (the white scum which appears on top of cement work when too much water is used) are removed. It is well to sweep off the surface with a heavy, stiff broom just ahead of the plastering. The mortar should be mixed rather dry, and applied as stiff as the masons are able to work it well. Excessive water again will weaken the work and prolong the process unduly. The mortar should be spread out, and screeded level with a straight edge. The surface will be improved if it is then flushed with a fairly thin 'soup," made of plain cement and water well mixed. This should be applied as soon as the cement plaster is levelled out, and not later when trowelling is in progress. The sprinkling of

dry cement at any stage of the work should be prohibited.

The mortar should then be left undisturbed until it gets partly set. Usually, when work is started on one side of a room, the first laid will be ready to trowel by the time the last of the plaster is applied. As soon as it can be trowelled without bringing much moisture to the surface, the whole floor should be gone over several times with rectangular plaster's trowels. The ordinary bricklayer's pointed trowel should be strictly prohibited if a good surface is desired. Excessive trowelling should be avoided. Usually, going over the whole surface three to four times will be sufficient. The masons should have small boards or old magazines to squat on while doing this. No attempt should be made to get a "slick" shiny surface at this time. To do so will involve unnecessary labour, and will almost certainly result in "crazing"—the formation of fine hair-like cracks—all over the surface, later.

Unless it is exposed to the sun or to hot drying winds, the floor may then be left just so until the next day. The first thing the next morning the doors may be blocked with a line of brick across the threshold, and the whole floor flooded to a depth of an inch or more. Care should be taken, when the water is poured on, not to disturb the still tender cement. It should be kept moist for at least a week—ten days or two weeks would be better. The easiest way to ensure its not drying out is to keep it flooded. At this stage an excess of water will do no harm.

If for any reason the plaster cannot be applied within 24 hours of grouting the brick, the latter must be very carefully cleaned off, and special care taken to remove any lime, mud, or other foreign substance which may have got on it. The floor should also be properly moistened, but not made too wet. The plaster on the brick need not be thick. Usually $\frac{3}{8}$ inch to $\frac{1}{2}$ inch will be required to allow for unevenness in the brick, but more is usually unnecessary. The floor will be more easily cleaned, and will look more "finished," if the floor plaster is carried up the walls about 8 inches high. The corner should be rounded, and, for the best appearance, the cement baseboard should be about $\frac{3}{8}$ inch thicker than the plaster it meets.

Any time after the fifth day after plastering the floor it may be drained and polished. Polishing is done by rubbing the surface with rather soft fine-grained sandstones. Even-textured stones, without hard pebbles embedded in them, should be selected. A somewhat coarser-grained stone may be used for the first time over, and followed by a finer. A large amount should not be polished off, as the sand will be too much exposed. A couple of men can easily smooth up a room in one to two days. The polishing may be carried out and the floor again flooded, or the polishing can be deferred until after the curing period. Water should be used

liberally under the stones when polishing, and the material ground off should be washed away at intervals.

When floors are constructed in this way, it is unnecessary to make them in small squares. Areas as large as 75 feet by 25 feet have been made in this way without expansion joints, and have remained for two years in one piece, no cracks having yet occurred even at work joints. Several as large as 25 by 40 feet have been down for some years without cracking. If a coloured floor is wanted, colour may be added according to the maker's instructions, and if proper care is taken to unite all parts to the base, the plaster applied may be laid in several colours. No attempt should be made to paint a floor made of cement within a year after it has been laid unless it is properly treated first. As soon as they have dried out, such floors can be waxed by using any good floor wax, or one made by dissolving bees-wax in turpentine, or by saponifying it with caustic soda or potash. This will improve the surface somewhat.

ROTHAMSTED EXPERIMENTAL STATION, HARPENDEN, HERTS.

ANNUAL REPORT, 1930, 172 PAGES, PRICE 2S. 6D.

Obtainable from the Secretary

Those interested in agriculture, more particularly from the point of view of plant nutrition and disease, will find in the annual report of our oldest experimental station, the record of a tremendous amount of detailed work conducted both in the field and in the laboratory. The Station controls two farms—one on the heavy land at Rothamsted, and another on a light soil at Woburn—and arrangements are also made whereby experiments may be conducted on the land of a number of progressive farmers in many parts of the country. Fertilizer experiments which are capable of a high degree of accuracy and provide an estimate of the reliability of the results are carried out on a system recently developed at the Station. This is an essential feature of experimental work in the field, and greatly adds to the value of the results for advisory purposes. In the present report the conclusions of the year's experiments on the effect of fertilizers on farm crops are given and related to the results obtained in previous years. This section forms, for specialists, students, and progressive farmers, an authoritative statement of the present position with regard to fertilizer experimentation in this country. For the expert the primary data on which the conclusions are based are printed in full.

As an example of the field-work on fertilizers may be taken a potato experiment of 1930 in which the point under investigation

was the effect of the "balance" of the various nutrients on the yield and composition of the crop. This is one of the most fruitful kinds of experiment because, although the necessity for the nutrients has been widely demonstrated, there is little information about the proportions necessary to give the best results. This experiment, like most others, showed the interdependence of the manures supplying nitrogen, potash, and phosphoric acid. The nitrogen and potash mutually increased each other's effect, while the two together markedly increased the effectiveness of phosphoric acid. Similar work on yield and quality is recorded for barley, sugar-beet, forage mixtures, and grass land. Next are described two new rotation experiments started in 1930 and intended to be continued for a period of years. One is designed to test various alternative methods of returning to the soil the straw grown on the holding, and also provides a comparison of rock phosphate with superphosphate. The other, conducted both at Rothamsted and Woburn, brings out, season by season, the effects on six different crops of a series of doses of the common nutrients, and will eventually form the basis of the study of the effect of a season on fertilizer action.

Work in the field by no means exhausts the activities of the Station. Much of the report deals with the object and results of the varied laboratory investigations on plant nutrition and plant disease. Many of these are highly technical, and are at present of purely scientific interest; but nevertheless such work is necessary for the future solution of technical problems. A few of the lines of work which have direct contact with practice may be mentioned. The results of scientific study of the nodule bacteria of the lucerne plant have now been carried into practice, and artificial inoculation of lucerne seed, according to a technique devised at Rothamsted, is commonly carried out by growers of this crop. Over 4,000 acres of lucerne were sown down with inoculated seed during the period covered by the report.

A further application of microbiolgical research is to be found in the artificial rotting of straw and other vegetable wastes by the controlled activities of fungi and bacteria; this is widely used in the preparation of organic manures at home and in the colonies, and the product is being exhaustively tested in field experiments. The course of decomposition is being further studied.

In the Physics Department a systematic study of soil cultivation is being made with the object of putting this costly item in the farmer's expenditure on a scientific footing. A beginning has been made with a detailed examination of the effects of rotary cultivation. The physical action of the treading of sheep—so important on light land farms—is also being studied.

In the Department of Plant Pathology the most extensive investigation is concerned with the so-called virus diseases which

seriously damage a wide range of economic crops. This is a problem of such complexity that systematic research from many points of view will be necessary before practical results can be expected, and a team of specialists is engaged in this work.

The report contains abstracts of over 70 scientific papers published during the year, as well as a list of 30 technical articles of a practical character.

On reading this report, one is struck with the fact that, as soon as the simplest aspect of crop production is brought under examination, the investigator is led into paths so obscure that only the expert can follow them. Much of this work will bear fruit in time, but is at first incomprehensible to practical men. At the same time, there is much on record which can be turned to immediate account by those who are on the look-out for the best information in matters appertaining to plant nutrition and soil management.

FUNGI AND HUMAN LIFE

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Human nature is anxious to have an insight into everything that it comes in contact with. Not only that much, but some try, and even do, penetrate deep into the phenomenon of nature and attempt to know their Why and What. Nature manifests itself both in the animal and vegetable kingdoms. Fungi belong to the latter class. It would be really odd for some to learn that fungi are plants, though not in the sense we know of plants. Ever since the far-off past, all sorts of persons have been harping on the manifestations of nature; and, as a result of persistent observations, the science of Botany has been mined out of human intelligence. But hardly a few have given their interest to a study of fungi, and people in general have not even cared to know what they are. Only a few lovers of nature have ever taken an interest in fungi, and the science of Mycology is of recent birth. It seems strange that this particular group in the vegetable world, with all its remarkable beauty of form, delicate colouring, and enormous utility, has failed to catch the fancy of the average man, and more strange is the fact that not only has it failed to attract human intelligence towards it, but it has created an indifference—rather repulsion—as if this particular group of plants is full of evils.

The main cause of this negligence on the part of humanity is the size of fungus plants. Leaving aside a few mushrooms and polyporus, the great majority of fungi are so small that they

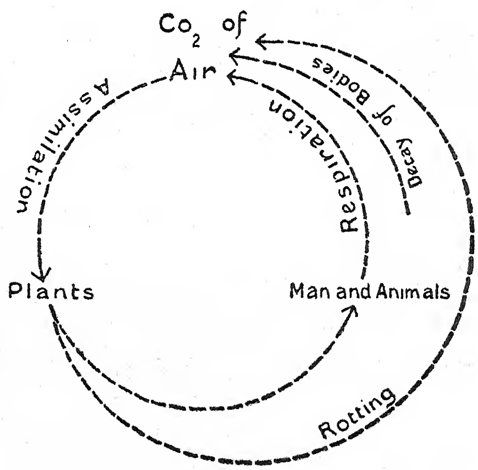
cannot be studied with as much ease as flowers and leaves, and some of them are beyond the reach of human vision; hence they are neglected by the average lovers of nature. No doubts scientists have tided over this difficulty by inventing powerful microscopes.

Fungi differ from the ordinary green plants not only in size and form, but they are more delicate in structure and mostly short lived. The most outstanding difference is in the nature of food ingredients, each obtaining its food in a manner peculiar to itself. Plants, as we know them, contain green colouring matter either in their leaves or stem. This green colouring matter is called chlorophyll. But fungi do not have this colouring matter.

Carbon is the most important substance used by all plants as food. We are familiar with charcoal, soot, and coal as the forms of carbon, but it would be quite interesting to learn that all organic substances, say paper, cotton, leaves, and sugar, contain carbon. Then how do the plants draw their supply of carbon? The common notion about the plants is that they obtain their supply of food from the soil. This may be true in most cases, but in this particular case it is a mere fallacy. Carbon is taken by plants entirely from the air. It exists in plants in the form of starch, sugar, and other carbohydrates. It is taken by plants in the simple form of a gas, which is colourless and invisible. Carbon exists as carbon dioxide in the atmosphere, and it is in this form that plants take it in. Leaves in the presence of chlorophyll and sunlight change this gas into complex solid organic substances like sugar and starch. The presence of chlorophyll and sunlight is absolutely essential for this transformation. Plants utilize carbon in this transformed form. Thus the supply of carbon is absolutely essential for the very existence of plants. No doubt there are some exceptions to this rule. They are mistletoes and dodder. They depend on green plants for their supply of carbon. It is equally essential for all sorts of animals. This supply man obtains in the form of flour, oil, starch, sugar, etc., all of which contain a high proportion of it. They obtain their supply of carbon from green plants.

Unlike plants, fungi have no chlorophyll; hence they have to be dependent upon green plants for their supply of carbon. Fungi obtain food in two ways: some draw their supply of food from the living plants, and they are called Parasites; while others live on dead vegetable matter, and so are called Saprophytes. It seems alarming that plants, men, and animals, and even fungi, draw their supply of carbon directly or indirectly from air. Air contains a very low proportion of carbon dioxide, and there is the risk of the supply being exhausted at any time. But it has never happened so far as history can penetrate back. This is because the supply of carbon dioxide in the air is being renewed

every minute. McCubbin says that this takes place in four ways. The first is through the respiration of all living things—animals, and even plants. Plants and stored seeds do respire just as man does. In the process of respiration oxygen is taken in, and this oxygen takes part in the decomposition of complex food ingredients into simpler ones. As a result of these chemical changes brought about by the active oxygen, carbon dioxide is produced; and this, being useless, is given out to the benefit of plants. The second is the fuel, which, on burning, combines its carbon with the active part of the air to produce carbon dioxide. The third is the occasional evolution from volcanoes. The last, but the most important, is the decay of vegetable matter in nature. In the process of decay of vegetable matter, fungi and bacteria take full part. In this way they obtain their supply of carbon. The fallen leaves, dried logs of wood, and grasses have got locked in them a considerable amount of carbon. Fungi and bacteria lay their hands upon the wastes of nature and make use of the useless deposits of carbon. In so doing, carbon dioxide is produced, and thus the supply of carbon dioxide in the air is renewed every minute. Considering the vast amount of vegetable matter produced each year, this becomes the most important source of the supply of carbon dioxide to the atmosphere. Had there been no fungi and bacteria, the wastes would have accumulated tremendously year after year, and there would have been no trace of vegetation on the surface the earth; consequently, life would have been extinct as soon as they had sprung up. Thus fungi and bacteria are the important links in the cycle of nature as vital as the utilization of the atmospheric carbon dioxide. Fungi and bacteria are ceaselessly at work every moment year after year and age after age, and thus by their useful work they have kept the Balance of Nature tight and perfect by returning to the air from vegetable remains as much carbon dioxide as is withdrawn from it. This process is manifested by rotting and decay. In this way fungi are one of the basic factors of the living world, both vegetable and animal.



Fungi are useful to mankind in various other ways as well. They have a variety of utilities, both direct and indirect. Every-

one takes bread without caring to know how it is made. People take vinegar and drink wines, yet they do not know how they are produced. Yeast is the agency which brings about all these chemical changes. Yeast is a fungus plant and looks like a branching tree of beeds. It is the exciting cause of fermentation in sugar solutions.

Brewer's yeast is a species of yeast which sets up fermentation in grape-juice in the manufacture of wine. The yeast plant is a sapropnyte, and thrives best in sugar solutions, which are split up into alcohol and carbon dioxide. Oxygen is necessary for the growth of the yeast plant; but its absence is helpful for the production of alcohol. These chemical changes are brought about by the active contents of the yeast plant called organized ferments or enzymes. These chemical changes are termed fermentation. Fermentation is nothing but a kind of respiration which takes place in the absence of oxygen. Yeast of the desired strain is allowed to grow in the flour paste; thus the paste is rendered suitable for bread making. Carbon dioxide collects as bubbles in the dough. These bubbles of carbon dioxide make the bread "rise" when baked; consequently, loaves have a porous texture.

Cheese is used for making sweets. It has to be ripened before it becomes suitable for use. In the process of ripening, fungi play the most important part. Vinegar is made by the action of a "mother," which is nothing but the good growth of a fungus which transforms alcohol into acetic acid by the process of oxidation. Acetic acid in its crude form is called vinegar. Thus fungi go on producing change after change from sugar to alcohol and alcohol to vinegar.

Pulses are said to be very nutritious because they contain a good proportion of proteins. They belong to the group of plants called Leguminous plants. Leguminous plants are not only useful as providers of pulses, but their roots and shoots are still more important as a green manure. Plants are buried into the fields with a plough and they have to rot before they are useful. Fungi and bacteria are responsible for the decay of vegetable matter and its transformation into a useful manure. Fungi can decompose straw leaves and stem and other plant materials in the manure heaps and turn them into valuable manures. This process is accompanied by the evolution of carbon dioxide, and in this way the proportion of carbon dioxide in the atmosphere is kept uniform. They are also responsible for the process of denitrification when nitrogen is evolved in its elementary form.

Many of the larger and fleshy fungi are edible and form rich table dishes. Great care has to be taken while selecting fungi for the kitchen because many of the fungi are highly poisonous. They bring fancy-prices to the growers in Kashmir and the Punjab.

This can create a good industry for export, as well as for home consumption, if they are grown and marketed on a co-operative basis by orchardists in cool tracts. No doubt they have an exorbitant demand of plant food from the soil.

Some fungi live with algæ (lower water plants) as one plant for mutual benefit, each one playing a separate function useful to the other partner, which it is incapable of doing itself. Such combinations are called lichens, and they are found all over cool places. Mosses and lichens are the only vegetation of ice-frozen areas like tundras and snow-covered peaks. There they supply food to animal life. This phenomenon of living together for mutual benefit is called Symbiosis. This phenomenon has also been observed in ordinary trees and plants. Some fungi live in the roots for mutual benefit. Such combination are called Mycorrhiza.

Thus fungi, which do immense service to humanity, rather account for the very existence of animal and plant life on the surface of the globe. At the same time, there is a wonderfully large list of fungi which cause immense harm to agriculturists in the form of diseases. In this way fungi are both useful and harmful to human beings.

DAHI

"Dahi or Curd," as they are known in India to-day, are purely products of circumstances. They are not the products of closely controlled methods of manufacture. Dahi and ghee are typically Indian products, and they have as yet only received a very cursory examination by dairy technologists. The field of "dahi" manufacture in India offers a promising scope for the research worker in dairy bacteriology and the enterprising dairyman. It is impossible to say what quantity of the total milk production of India is yearly consumed in the form of dahi, but it is a high percentage.

The history of the use and virtue of curdled milk dates back to antiquity and to the early days of the domestication of animals. The curdling of milk in those early days was inevitable, due to the lack of ideas on sanitation, and the general manner in which milk was cared for. To-day also in many countries people enjoy fermented or curdled milks made in a variety of ways. People have known about the fermentations (which small micro-organisms can produce) without knowing anything about the organisms themselves. This briefly is the situation in India. The manufacture of "dahi" is a home and indigenous industry in which people are securing a certain type of curd produced by micro-organisms, without, on the

whole, or to my knowledge, knowing anything about the micro-organisms which produce these changes.

Due to the therapeutic claims made for certain types of fermented milks in Europe, England, and America, many investigations of recent years have been made to check up on the claims made, and certain therapeutic claims have now been definitely established. The writer will develop this theme in a subsequent article.

The usual methed of preparing dahi in the home is to boil the milk, first of all, and allow it to cool down by setting the container in a vessel containing water that is frequently changed as it warms up. This "boiling" destroys undesirable organisms. When the milk has cooled down, it is "set." This is done by inoculating the boiled milk with a "starter," usually some curd from the previous batch, or it may be done by a powder culture of pure bacteria. The "starter" itself should not be boiled as that would destroy the micro-organisms present, which we wish to propagate.

The real danger of dahi lies in the chance that the "starter" may not be pure, and may introduce organisms having a harmful effect on the digestive system. Curd that does not have the normal aroma and flavour of good dahi should be rejected.

Due to the importance of this subject, and the limited space available in this number, the writer will give a major article on dahi in the coming January number. The writer will also welcome from our readers "household lore" on the subject.

GRADING

Lt.-Col. I. Jarret-Kerr

Chairman of the Executive Committee of the Rural Reconstruction League of India, New Delhi.

An essential preliminary to the "Better Business" part of Sir Horace Plunkett's slogan for Rural Reconstruction, with the consequent results of "Better Farming," lies in the grading of Agricultural Products.

We may venture to say that little is known of this subject in India. Grain merchants, on a large scale, may use "Refraction" tests; but the poor producer, who is the man most interested, is abysmally ignorant of any such thing.

He may separate his different varieties of cotton, but not by staple, etc., and even that is of a very haphazard nature, and carried out by few.

We understand that attempts have been made to induce the Cotton Cess Committee of the Punjab to take up this matter, but without success.

We have heard of the successful results achieved by the Trinidad Cocoa Producers' Association, which has resulted, not only in obtaining better prices for their products—"Better Business"—but has also led to "Better Farming" in order to obtain the advantage by producing higher grades, and also the value of "Co-operation;" thus "Better farming, better business, better living."

There is another sort of "Better Living," of course, of which brighter buttons are the evidence. The Army and Navy know that smartness all round, means greater efficiency, through self-respect.

Would not cleaner villages have the same effect? Then we could alter the order of Sir Horace Plunkett's slogan, and put "Better Living" first! That by the way.

The Cocoa Producers' Association had to fight the same bitter opposition by the middle-man, as the Grange and other Associations had to carry on in the U.S.A.

Dr. Hatch, of the Y.M.C.A. Rural Demonstration Centre, Martandam, Travancore, is killing two birds with one stone: He is demonstrating the value of grading, and training the young folk in his area in "Co-operative Marketing," better business all round.

How did he set about it? Eggs.

But, before you come to the egg, you must have the poultry. So he set about improving that, over which he spent five years. He introduced better strains, gave prizes for cockerels, giving rise to healthy competition, like the "Calf Clubs" in the West. He taught "better farming" of poultry. He was able also to demonstrate "better living" (cleaner living) by showing that the best results were only obtainable under cleaner conditions. Then came the time for the "Co-operative Marketing." And fortunately the centre was near the school, so that the young folk were able to bring eggs to the centre on their way to school, see the testing and grading, and earn part, at least, of their school fees in this way. "Better Business."

We hope that the "culls" (rejected eggs, for size!) were eaten, enabling them to learn the lesson of "better living" in healthier bodies. Are there any "calf clubs" in India" or anything like them?

Dr. Hatch's system seems the nearest approach to them.

"Calf Club" is a club of young people, each of whom undertakes to rear a calf, and prizes are offered for the most successful. Advice is freely given by veterinary officers. It seems rather like "The Project" system of education.

Dr. Hatch did the same for Bee-keeping (Honey), Palmyra Sugar, and Cashew Nuts.

Education of the townsman should be undertaken in "better living." The illusory advantage of gaining a pie on the price of milk, ghee, etc., and spending days "off duty" owing to consequent ill-health. Otherwise the value of grading is reduced. Educated people with cooks should insist on better ghee; for instance, Dr. Hatch's system of Education might well be adopted in all Agricultural Bias Schools. But we fear it would mean a lot of "weeding out" of masters who prefer deep, and ancient ruts, as well as of those invested with the duties of inspection examination and the direction of policy. Rural people say that they do not really want to see the community rise, for fear of increasing the competition for jobs. If that is so, urban people who have risen from the ranks of the villager are being very shortsighted, and equally so the "merchant."

SOME ENEMIES OF THE INDIAN FARMER

B. Allepa and Ray E. Rice, of Damoh, C.P.

It would seem that most of the farmers stay in their villages just because their fathers and grandfathers lived there. They know of no other plan. They are rooted there even though life is very precarious for them. Some say that, if the village as it is and if farming as it is, were good enough for their fathers, they are good enough for them.

On the whole, little effort is made to improve conditions. Methods and farm management, if there is such a thing, are about the same as they were a thousand years ago. Likewise the villages over the land appear about the same, except that stone is used where it is available, and mud is used where nothing else can be had. Thatched roofing and tile roofing are used according to the materials at hand.

One wonders how the Indian farmer has the nerve to keep on and on where he has to battle against so many enemies. It is no wonder that he feels depressed. We have been hearing of the depression among the American farmers. This is no new thing among our Indian farmers. They know of nothing else. But they have become accustomed to conditions as they are so they go on in the same old rut.

Village conditions all over India are not the same. We must remember that India is some 1,500 miles wide and some 3,000 miles long. Its northern line is about the same as that of southern Indiana. But, when one goes down south, he is in the tropics, and all is different. But the land is a farming land. There are about 700,000 villages which dot the country-side. The people live in those villages and farm the adjacent land. About ninety per cent

of the population lives on the land. The live stock lives in the house or in the court-yard with the family. Just as the climate differs, the crops differ. In some parts only rice is grown. In others one finds wheat, sugar-cane, gram, etc.

The readers asks how 320 millions of people can live in such a small area. And one wonders the more when he sees vast areas which are wooded and are not culturable. Along the Ganges valley very intensive farming is done. That part is thickly settled. One finds hill tribes which eke out an existence in the jungles. Sometimes one wonders why more land is not cultivated. Again, when one sees the uphill battle for the farmer, he realizes that little is to be gained by his efforts.

That which may be a terrible enemy to the farmer in one locality may not be such in another place. Along the foot-hills of the low mountain ranges wild animals forage the crops at night. The poor farmer, who works all day, has to guard his fields by night. Wild hogs are about the worst of all. They come in droves of twenty or thirty, and do a lot of damage. The poor farmer fixes up a Standard Oil tin on a rope; he pulls that with his foot, and its gong frightens the animals away. As there are no fences, they go to the next field and carry on their destruction. The blue cow, elk, all sorts of deer, spotted deer, jackals, porcupines, bison, wild elephants, and rats all come in for their share. A watch-tower in the centre of a field is an ordinary fixture. From this place the little girl uses her sling shot to keep the birds out of the caffir corn. The farmer sleeps there at night. Not only are these animals destructive in the sense that they devour the crops, but they sometimes charge the man too. They become bold for most of the farmers are without guns.

When the wheat is about ready to harvest, one sees thousands of green parrots at work. They pluck the full head from the stalk, carry it to a near-by tree, and eat what they want of it. Birds are a great enemy of caffir corn. Of course, the birds are friends, as well as enemies. They kill many obnoxious insects, and they serve as scavengers; but they also eat lots of grain.

Wild animal, birds, insects, rust, grasshoppers, and many other enemies are visible. But there are also many other enemies which are not seen with the naked eye. One of them is debt. The social life of the village is tame. But for weddings, funerals, and festivals money seems to be at hand. The farmer borrows money from the money-lender at a high rate of interest. He puts himself in debt for the rest of his life. If asked why he does it, he says that custom demands it; and he is right.

Strange as it may seem, the farmer enjoys a court case. Because of a land encroachment or some small matter, the farmer goes to court, and that costs him a lot of money. He increases

his debt. These cases go on for a long time, and the debt grows month by month.

If the farmer has a short crop, he must borrow money or seed. The head of the village may give him seed, but he takes it back with one-fourth or one-half extra, and sometimes takes interest too. If he borrows money, he does well if he pays the interest, for it is very high. Interest ranges all the way from ten per cent to seventy-five per cent.

Another enemy is dirt. True enough, it can be seen, but it is not seen. That is just the point. Much of the village uplift work is directed towards a war on dirt. Pits are being dug in some places. Malarial mosquitoes are given full range to breed in the water about the village. It is no wonder that the infant mortality rate of India exceeds all other records of other lands. It is a wonder that the natural immunity saves as many as do survive.

The Indian farmer is face to face with disease. The vaccinator makes his visits, and gives the vaccine for smallpox. Many sorts of fevers undermine and cut down the energy of the people. Malaria is the worst enemy of all. Many of the people do not have half their energy for they are full of malarial germs. Hookworm, veneral diseases, and tuberculosis are terrible enemies too. Dirt and disease seem to go hand in hand.

Coming back to the farming part of the work, most farmers do not know the first principles of farm management. The work is done in seasons. The same sort of tools are used to-day as were in vogue two thousand years ago. The grain is all cut with a sickle. Most of the farmers do not have any subsidiary industries. Their animals which pull the implements are small. Their breeding bull is small, and many times the poorest bull in the herd does the breeding. The name of this enemy is ignorance.

Nowadays, such institutions as the Allahabad Agricultural Institute are working hard to overcome this enemy. But they have another enemy which is worse than ignorance. It is a lack of care for better methods. A neighbour's field may produce one-third more rice because of transplanting, but the other farmer goes right on with his age-old broadcasting habit. It is most difficult to get him to change. Really and truly, change seems to mean pain to that farmer.

Another enemy of the farmer is poor seed. He does not care for the sort of seed he plants. There is no such thing as selection of seed. This is his enemy which he does not recognize at all. He has heard that No 115 wheat is rust-proof, but he does not try to get that seed and his crop goes bad.

It is true that the average farmer does do quite a bit of work on the little walls about his field. But much of his good earth is

washed away. We may call it ignorance or laziness. And, hand in hand with that loss, he burns the cow-dung to cook his food, and does not conserve a fertilizer. He does not realize what an enemy this is. And yet his neighbour, who has adopted better farming plans, shows what a fine crop can be had.

Who can blame the Indian farmer for being satisfied to live with his enemies? He likes to sit about in the sunshine. He likes to spend much time with his pipe. He likes to sit with other men and talk. It is easier to do these things than it is to work. If there is food in hand for one day, many are satisfied and do not worry too much about the next day. The women want oraments. Money is borrowed for these. A wedding takes out time and calls for more money. The caste demands a big meal for the group, and more money is needed. Not being educated, the men and women are satisfied with their old regime. They love quarrels and fights. They are satisfied with things as they are. They do not work for better milch cows. They are animal poor. They have thousands and thousands of worthless cows about the villages, but they cannot kill them because the cows are sacred. There is not enough pasture for all of them. They seem to be slaves to conditions which are difficult to change.

It is a strange strain in human nature, but at evening time one sees a quiet, calm, satisfied, happy village. No one seems to be worried. The men are sitting about the fire. The women are cooking the evening meal. The cows are coming up the lanes. All is peace and quiet. And in their midst are all of these enemies, but they do not seem to fret much about them. There are many more which we have not mentioned, but the Indian farmer will go right on as he is, and will be changed very slowly by forces which will bear down on him and convince him that he can overcome his enemies.

PRACTICAL HINTS ON POULTRY HOUSING AND EQUIPMENT IN INDIA*

By Capt. W. Sherrard-Smith, M.C.

Introduction

Why has this article been written when there is so much literature on the subject of poultry-keeping in India?

It is because I am convinced that the methods of housing poultry advocated by eminent authors are not practical.

I acknowledge the labours of those authors for their most valuable advice on poultry-keeping in general, but that they have gone adrift on the housing problem is an open secret.

*Reprinted, with acknowledgment from the *Indian Poultry Gazette*, July, 1932.

Will the management of some of the large poultry farms in India honestly say that their houses are free of ticks?

While accepting the principles laid down in these textbooks as correct, the houses do not in practice, afford all the qualities attributed to them.

One eminent writer asserts that the most important item of poultry-keeping is feeding. What is the use of correct feeding if the fowls are incorrectly housed? The reverse is also true; but, whereas faulty feeding can be corrected and proper feeding conducted on regulated lines without any additional cost, improperly-constructed houses once made are white elephants for ever. And only after a great deal of expenditure can fresh ones be built, or the old ones modified if made of suitable material.

The House

The essential requirements for a suitable house must answer in all respects to the items numerated below, in order of merit:—

(1) Must be vermin-proof;
(2) Must be easily cleaned;
(3) Must be cheaply and effectively disinfected;
(4) Must be cheaply constructed—suitable alike to the poor villager and moneyed fancier;
(5) Must be adaptable under the eaves of the poor villager's hut, John Citizen's out-house verandah, or the specially-built shed of the commercial farmer;
(6) Must be permanent, and yet portable;
(7) Other essential requirements, such as damp and wind-proof, warm and cool, as the season demands, are factors easily controlled; and a practical breeder will have no difficulty in making modifications to suit requirements when he has installed one or more of these houses which I am about to describe, and which I will in future refer to as W. S. house.

(1) *Vermin proof.*—Look at the diagram of the house itself; figure I is a W.S. (A) type of house. A glance will show you that the entire house is a Vermin Proof.

(2) *Cleanliness.*—A house into which you have to enter for the purpose of cleaning becomes at once a messy job. By simply removing the front door, and with the help of a scraper, the job is quickly and easily done, even by a mere lad mounted on a stool. A handful or two of clean earth sprinkled evenly on the droppings-board completes the job.

(3) *Disinfecting.*—What villager can afford to purchase disinfectants? How many advanced fanciers ever do before the damage is done? How many of us who keep poultry as a hobby ever think about it? Take it from me, very few indeed. Well then, how is the house disinfected? "Cheaply and effectively?" Did I say cheaply? Well, I mean at no cost at all. Just this—remove the perch (which is the only wooden part of the house). Move the house away from anything inflamm able (two people can lift it with ease), fill every nook and corner of it with dried leaves, straw, twigs, and paper; in fact, anything that will burn; put a match to it and in a minute the house will be as free of vermin as the day it was made! I do this every six months, after which a coating of tar is applied to the iron-work to freshen it up. The money which I might have spent on disinfectants is kept in my pocket.

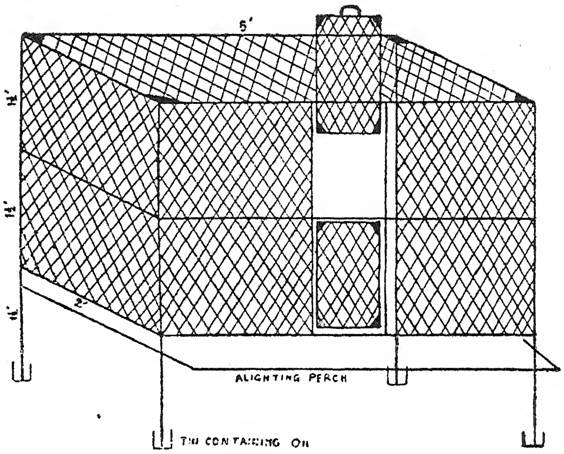


Fig I. W. S. (A) Type

(4) *Cost.*—The cost of the house will work out to about Rs. 12; it will accommodate sixteen full-grown birds kept in the most fastidious manner, and twenty-four birds on the more intensive system, with little or no discomfort to the birds. Even with twenty-four birds in each house, the birds will be happier, and conditions far more sanitary than those of 80 per cent. of poultry fanciers who claim to keep poultry.

(5) *Adaptability.*—The house may be placed anywhere—under an old cow-shed, under a verandah roof, or even under the eaves of a house.

(6) *Portability and Permanency.*—By opening a few nuts the whole house falls to pieces, and tied in a suitable bundle, will fit under the seat of a railway carriage or at the back of an ekka, the one-pony conveyance in almost any village in North India. The house should last a lifetime. Taking this at threescore years and ten, the cost will work out to a few annas a year. Why, the repair bill alone for the usual type of house will work out to many rupees a year!

(7) *Controllable Factors.*—Provided these houses are placed under a shed, which should also provide protection on three sides from

sun and wind, no further protection will be required for the grater part of the year. During the winter months old gunny bags are tied round the house on three sides and the top. If necessary the front may also be covered, leaving at least 6 inches at the top for air. Bran is usually supplied in sacks, and I save these for the winter, after which they are burned as they stand on the houses. The sacks or other material used may be removed, cleaned, and stored for the following winter if necessary.

W. S. (A) Type Construction.

Angle iron $\frac{3}{4}''$ by $\frac{3}{4}''$ by $\frac{1}{8}''$ bent to form a rectangular shape 5 feet long by 2 feet wide. A piece of flat iron 3 inehes ong by $\frac{3}{4}$ inch wide and $\frac{1}{8}$ inch thick is rivetted on so as to join the two ends together. Triangular pieces of flat iron $\frac{1}{16}$ inch thick with $2\frac{1}{2}$ inch sides, are rivetted to the four corners to make the frame secure. Three such frames are required. Thin galvanised sheeting is fixed to the top of two of these by turning the ends over so as to fix them to the angle iron. These will function as the floors or droppings board of the top and bottom compartments respectively. The third frame is fitted to the top of the house and will function as the roof or top of the house. The lowest floor or "shelf" only will require holes to be made along the angle iron at intervals of three inches, for fixing the wire netting which forms the sides of the house.

Now make the four legs of angle iron 1″ by 1″ by $\frac{1}{8}''$. Each of these $4\frac{1}{2}$ feet long. $1\frac{1}{2}$ feet from the bottom holes are made and the bottom "shelf" is bolted on in position. $1\frac{1}{2}$ feet above this, the top "shelf" is bolted on. $1\frac{1}{2}$ feet above this again the third rectangular frame is bolted on. The making of the remainder of the house is easily followed from the diagram. A strip of wire netting of $\frac{1}{2}$ inch mesh is laid, over the top of the house. Another strip of wire netting of the mesh three feet wide, is run round the house from door-post to door-post. The bottom selyedge edge of the netting is fixed to the bottom "shelf" by means of the holes in the angle iron made for the purpose, while the top selvedge edge is attached to the wire netting laid across the roof of the house.

The door side posts are made from flat iron 1″ by $\frac{1}{8}''$. Flat iron of similar dimensions is fixed to the top rectangular shape, in such a manner so as to permit of the door sliding in from the top. Another piece is fixed exactly in the same manner to the floor of the top compartment, and a piece of one inch angle iron is fixed to the bottom floor in such a manner that the door comes to rest on one of its wings, while the other wing prevents it from slipping outwards. The door is made of angle iron $\frac{3}{4}''$ by $\frac{3}{4}''$ by 1″ with wire netting; the door is actually made in two parts one for the lower

and one for the upper compartment. Both slide in from the top, the door oí the upper compartment resting on the lower door. At night both compartments function as roosts, while during the day the lower one serves as nests.

The perch is only 3 inches high, in two parts to permit of easy removal. Two small blocks of wood each 3 inches high are nailed to each end of a batten 2½ feet long 2 inches wide and 1 inch thick. Two such perches are placed on the droppings board of each compartment end to end, to form a continuous perch through the length of the house. An alighting perch may be either fixed to the house, or fixed to four legs and placed in front of the entrance. In the diagram this is shown fixed to the entrance of the house by means of bolts.

W. S. (B) Type Construction.

The construction of this type of house is nearly the same as the W. S. (A) type. The only modifications are as follows:—

(1) Holes are made along the angle iron of the top "shelf" on the front side only, for fixing the wire netting.

(2) No holes (for fixing the wire netting) are made along the front angle iron of the bottom "shelf" but along the other three sides only.

(3) Five seperate nest boxes are provided in the lower compartment by fixing partitions made of thin galvanised sheeting.

(4) An iron rod is passed through these partitions two inches from the top and an inch from the front on which the trap-doors are suspended.

Note:—This type of house is necessary only when part-nesting is practised.

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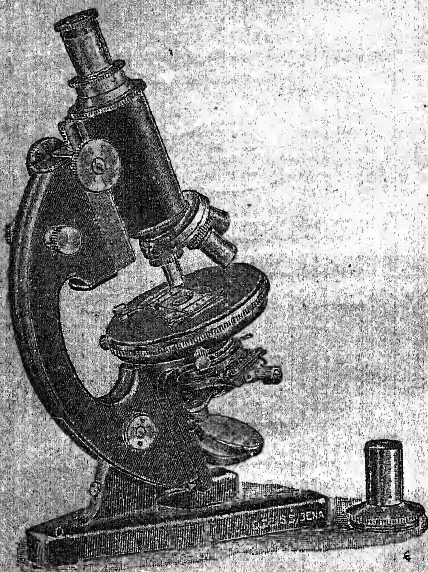

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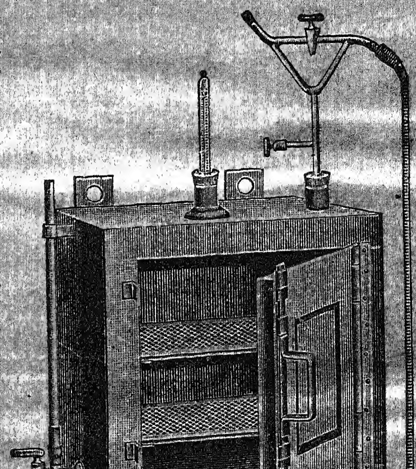

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